

# Compressed Air

*Magazine*



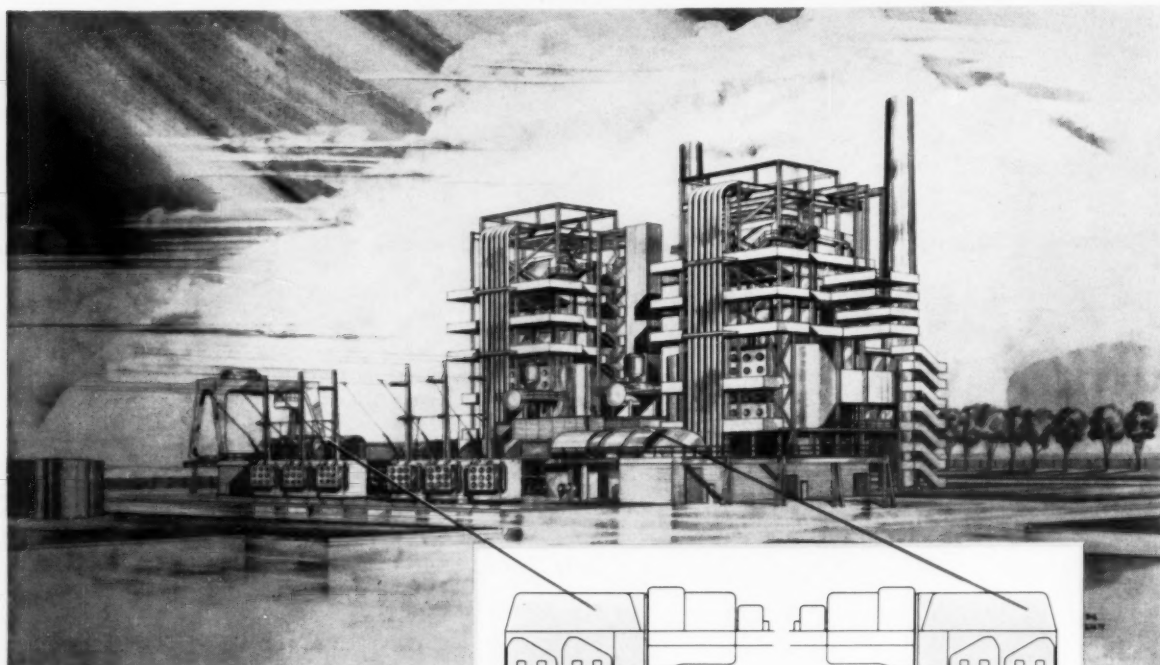
EAGLE LIFT SIPHON  
NEARS COMPLETION

One Of The United States'  
Seven Civil Engineering  
Wonders Is Enlarged

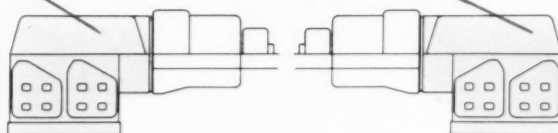
OCTOBER 1958

NEW YORK • LONDON

For Southern California Edison Company's  
new Huntington Beach Steam Station\*...



\*Bechtel Corp., Engineers & Constructors



## Ingersoll-Rand axial-inlet condensers will serve each 200 MW unit

Designed for an eventual four units, the first two units of the new Huntington Beach Steam Station are now under construction. Turbines are cross-compound axial exhaust, 2400 psig., 1050°/1000°, 3600/1800 rpm. As indicated above in the artist's rendering, these units will be served by axial-inlet condensers, specially designed for this installation by Ingersoll-Rand. These I-R condensers are 2-pass units, each with 110,000 sq ft of surface.

In addition to the surface condensers, Ingersoll-Rand is furnishing the following associated equipment:

- 5 boiler-feed pumps rated 2020 gpm at 6400 ft TDH.
- 4 vertical condensate pumps, 3-stage, rated 2500 gpm at 350 ft TDH.
- 5 condensate booster pumps, rated 1851 gpm at 1970 ft TDH.

4 vertical condenser circulating pumps, rated 44,000 gpm at 35 ft TDH. The columns and discharge head sections are lined with Fiberglas.

2 steam-jet ejector units, 2-stage, single-element with surface-type inter and after condensers.

2 horizontal reciprocating vacuum pumps each driven by a 100 hp electric motor.

This installation is another dramatic example of Ingersoll-Rand's ability to meet the requirements of the modern steam plant...with advanced design surface condensers, pumps and associated equipment. Your I-R engineer will be glad to help you determine the equipment best suited to *your* requirements.



**Ingersoll-Rand**  
4-874 11 Broadway, New York 4, N. Y.

THERE'S NO SUBSTITUTE FOR EXPERIENCE IN ENGINEERED PRODUCTS

# KEEP IT CLEAN

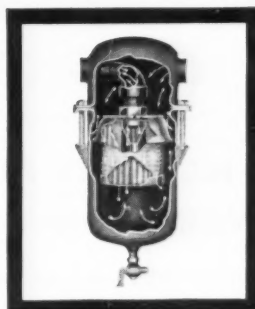


by Phil Tration



As a batter, Bill couldn't hit beans;  
Got dust in his eyes, it seems.  
Someone whispered the clue—"Use a Filter, Staynew,"  
Now, he hits the ball like a fiend.

Let's see how your batting eye is. Take a look at the advantages of Dollinger Staynew Filters—they do a top job of cleaning, they're easy to maintain, and they're available for whatever degree filtration you need. Don't get caught in a squeeze play; call in your Dollinger sales engineer today. He'll show you how to stay away from those "foul" lines—foul air, liquid, or gas lines, that is.



**STAYNEW MODEL CPHS PIPE LINE FILTER** has the exclusive "double action principle." Air is first deflected to outer walls of Filters and forced downward at high speed. Water, oil, and heavier particles of rust, etc. are thus deposited in base. Mechanically cleaned air then rises to pass through filtering medium which removes lighter airborne particles. This "double action" design eliminates need for frequent cleaning.

Inexpensive, simple to install, Dollinger Pipe Line Filters pay for themselves in reduced maintenance alone. Why not talk over your filtration problems with a Dollinger engineer . . . or write for Bulletin 200 which gives engineering data on pipe line filters. Dollinger Corporation, 7 Centre Park, Rochester 3, N. Y.

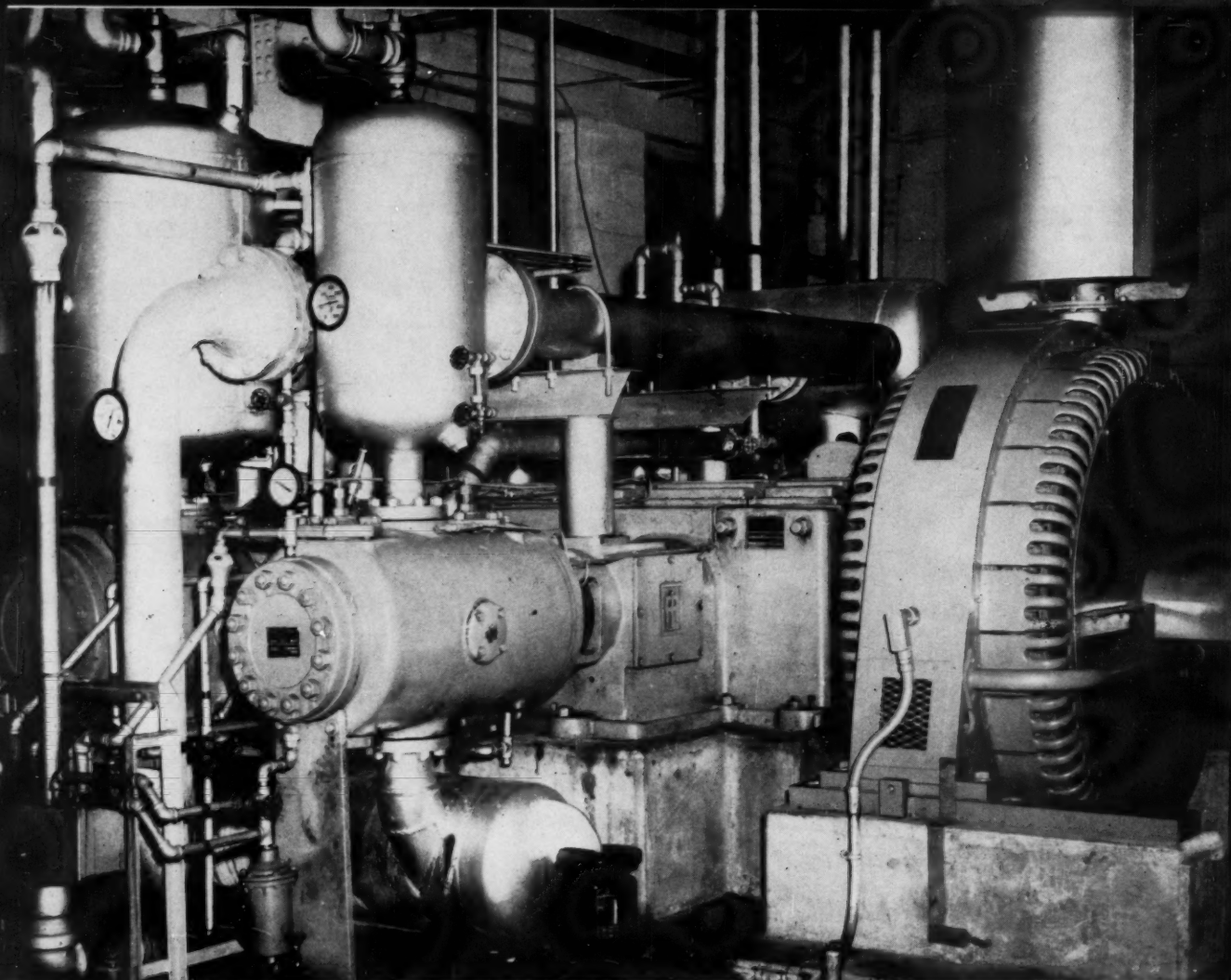


## DOLLINGER



SPECIALIZING IN DRY TYPE FILTERS FOR OVER 35 YEARS

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# FREE AIR?

**NOT FREE AIR, BUT LESS COSTLY AIR . . .  
DEPENDING ON THE COMPRESSOR OIL YOU CHOOSE**

To help lower the operating costs of your air compressors, simply remember these important factors when choosing an oil:

**Texaco Regal Oil R&O is specially designed for air compressors, keeps them free from rust and harmful deposits.**

**It keeps lines open, rings and valves functioning properly.**

**There is a complete line of Texaco lubricants—one for every type and size compressor, for every operating condition.**

Your Texaco representative can quickly direct you to the right one. Just call the nearest of the more than

2,000 Texaco Distributing Plants in all 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



**LUBRICATION IS A MAJOR FACTOR IN COST CONTROL**

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

# Compressed Air Magazine

Founded 1896

VOLUME 63 NUMBER 10

October 1958

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PHOTO, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

## ON THE COVER

THE water supply system of the Metropolitan Water District of Southern California is rightly judged one of the nation's seven civil engineering wonders. The billion-gallon-per-day system is now being enlarged to its ultimate capacity, thus bringing to fruition plans originally laid in the 1930's. Part of the work is depicted by our cover picture, which shows what is considered to be the hardest to install of 47 inverted siphons. The second barrel of each of these is being added now, thus making it possible to use the full capacity of the original tunnels. Additional work includes the enlargement of pumping stations and reservoirs.

## FEATURE ARTICLES

### Page 14 Building The Rocket Engine—R. J. Nemmers

This is the season of the year when high interest is aroused by the coming of new automobile models. Some of the production techniques and quality control measures adopted by Oldsmobile in the assembly of its well-known engine are described in this article.

### 20 Hardware For Concrete—P. J. Colwell

To erect concrete structures in the most efficient way and in the safest manner requires all sorts of bent-wire hardware. This article tells the story of Richmond Screw Anchor Company, Inc., and the role it plays in this diverse industry.

### 24 Recovering "Wasted" Horsepower—H. F. Smith

The ingenious application of a special type of turbine is responsible for recovering a considerable amount of energy that once was lost. The power is put back into a petroleum-industry process as it is used to drive gas compressors.

### 26 The New Aeroscope—Peter Sleight

The clock turns back to an early motion picture camera that was powered by compressed air. Here is the story of the device and its inventor.

### 28 Air Power Reduces Railroad Repair Time

Specially designed, compressor-carrying trucks help eliminate costly delays.

### 32 A Chef Who Works With Ice Cakes

In the realm of unusual applications, a Canadian chef chisels weighty ice blocks.

### 34 Spray Drying

With sales of \$6,000,000 annually, spray drying is one of the fastest growing unit operations in American industry.

### 35 Map Paper

A new laminated map paper is made on a miniature Fourdrinier machine.

### 35 "Rube Goldberg" Garage

The Autosilo in Basel, Switzerland, represents the latest in push-button parking.

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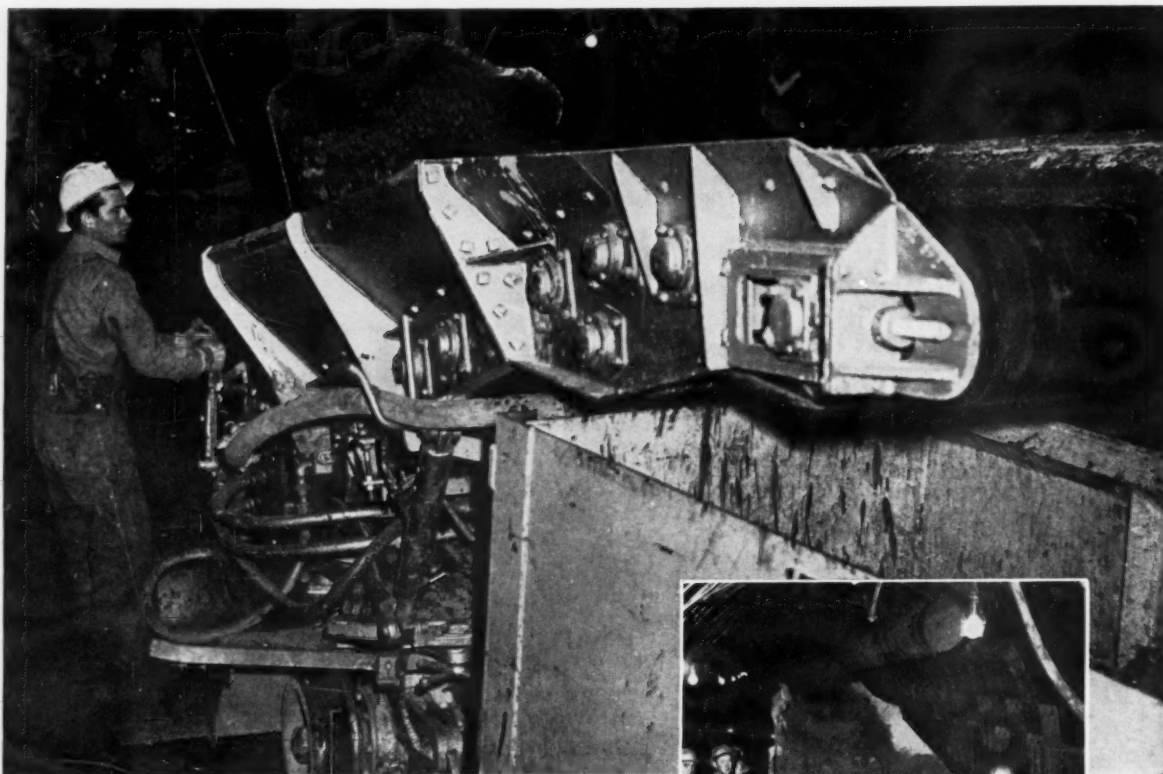
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11 Broadway, New York 4, N. Y.

**EPA**

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Eimco Model 40H Loaders are being used in many of the high speed tunnel jobs in work today. These machines are making it possible to average high daily advance footage in all types of ground.

## THE DEPENDABLE EIMCO MODEL 40H

Successful contractors, the world over, who make a profit on their job and achieve records in tunnel speed, have learned through experience that you cannot beat the Model 40H for dependable, month in and month out, high performance.

There is now available the Model 40W for headings 14 feet wide — and wider.

The experienced estimator figures his cost on the basis of using dependable, efficient, low-cost Eimcos.



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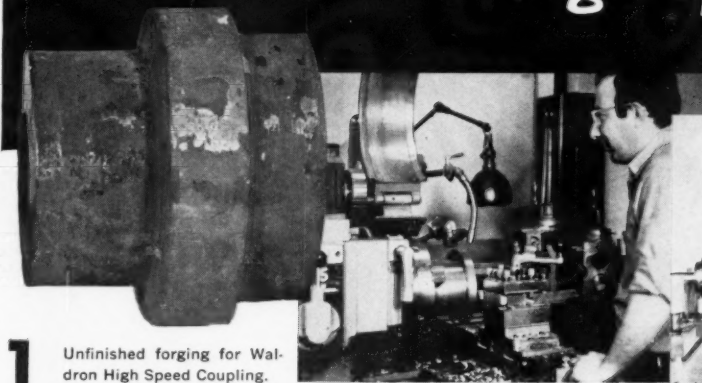
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Seattle, Wash.

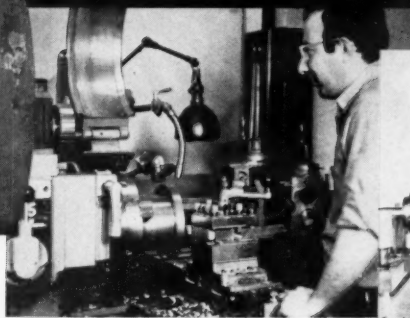


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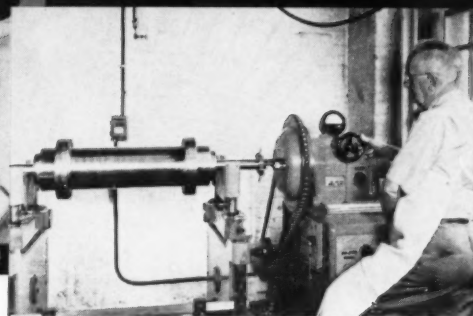
# HIGH SPEED DRIVES CALL FOR JOHN WALDRON High Speed Couplings



**1** Unfinished forging for Waldron High Speed Coupling.



**2** Machining operation on Waldron High Speed Coupling at New Brunswick Plant.



**3** Dynamic Balancing of High Speed Coupling.

Today's high speed turbines and turbine-driven compressors are built like fine watches. They have to be to stand up under the terrific strains and stresses of the greater velocities. Good materials, accurate machining and balancing are essential to their service life and efficiency.

Equally important in the efficient operation of this equipment is the coupling—the power link between the turbine and the compressor. That's the reason for the extreme care in the manufacture of all Waldron High Speed Couplings.

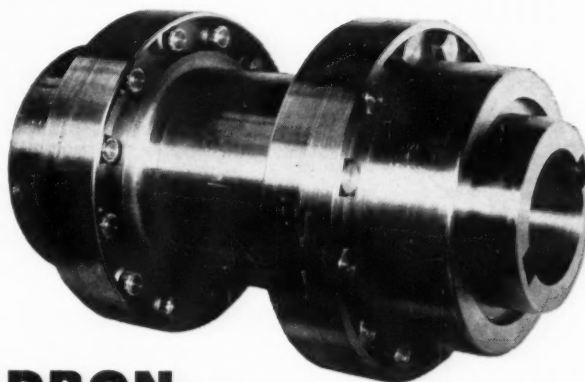
John Waldron uses quality forgings made from SAE 4140 steel, heat treated to a Brinnell of from 285 to 315 on the outer sleeves and 225 to 255 on the hubs. This gives a good operating differential in hardness which is considered beneficial for the longer service life a high speed coupling requires.

The John Waldron method of balancing serves as a double check on the accurate machining. The nuts and bolts are all weigh balanced, the hubs are balanced separately and the complete unit is balanced on an arbor and match marked for ease in reassembly.

The result is a perfectly made and balanced coupling—and one that stresses material, workmanship and design.



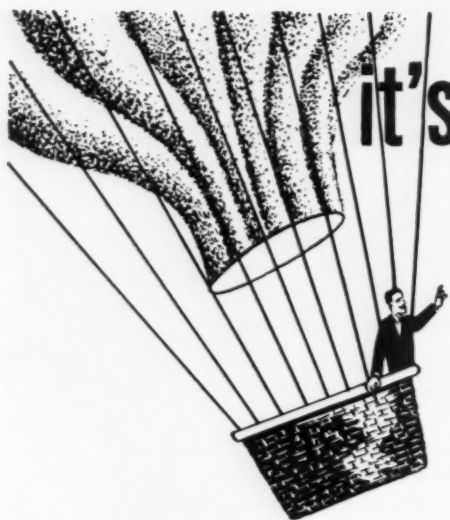
**4** Assembling High Speed Coupling.



**JOHN WALDRON CORP.**

A subsidiary of Midland-Ross Corporation  
NEW BRUNSWICK, NEW JERSEY





# it's **HIGH** time you tried *Fulflo Filters* for

## **HIGH** EFFICIENCY

Fulflo Filters for compressed air, minimize gumming — remove moisture, oil, microscopic rust, dust and scale from your air lines. Single-tube B-A model has 3, 5 or 7-inch Honeycomb Filter Tubes for 10, 30 and 60 cfm at operating pressures up to 125 psi. A-F model has flow rate of 60 cfm at operating pressures up to 250 psi.

## **HIGH** PRESSURE

This rugged filter withstands operating pressures up to 4000 psi. Flow rate is 1.5 cfm at 4000 psi — the equivalent of 410 cfm of free air.

## **HIGH** CLEANLINESS

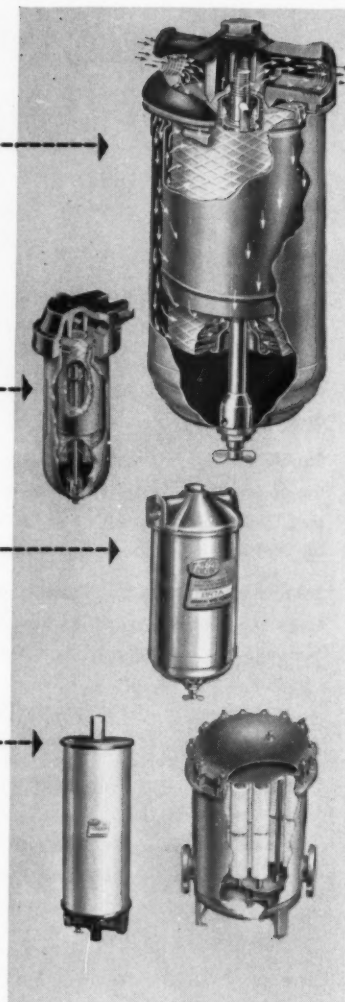
New nickel-plated brass filter is completely sanitary and non-rusting. 7-inch Honeycomb Filter Tubes have flow rate up to 76 cfm of free air at operating pressures of 100 psi.

## **HIGH** CAPACITY

For high flow rates or central installations, WY models have three, six, twelve or eighteen Honeycomb Filter Tubes in parallel. For 1½ and 2-inch pipes. New WH model is made in thirteen models — from 24 to 270 Honeycomb Filter Tubes in parallel. For pipe sizes from 2 to 6 inches.

Fulflo Filters are rugged and durable. Honeycomb Filter Tubes are low in initial cost, economical in maintenance-free operation and exceptionally long life.

With Fulflo Filters, the quality is **HIGH** — the price **low**.  
Write for new catalog to Department CA.



### **COMMERCIAL FILTERS CORPORATION**

MELROSE 76, MASSACHUSETTS

PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

**MICRO-CLARITY AT MINIMUM COST**



with genuine Honeycomb Filter  
Tubes for controlled micro-  
clarity of industrial fluids.



Selective filtration of oils • water-oil  
separators • magnetic separators •  
pre-coat filters • coolant clarifiers •  
automatic tubular conveyors.

How three Eastern drillers

# PARLAYED 3 DRILLMASTERS INTO 18

with big profits from the I-R **DOWNHOLE** drill

These three case histories tell a story that is vitally important to anyone engaged in blast hole or water well drilling. If you want to improve your profit picture in a growth business, it will pay you to look into the many exclusive advantages of the I-R Drillmaster and **DOWNHOLE** drill. Ask your Ingersoll-Rand representative for complete information, or send today for a copy of Bulletin 4179.



**Sullivan Trail Coal Co.**  
West Pittston, Pa.

To speed coal stripping operations at a number of separate mining properties, Sullivan Trail purchased its first I-R Drillmaster on June 7, 1955. This was a TRUCM rig, mounted on a 6-wheel highway truck and equipped with the revolutionary I-R **DOWNHOLE** drill. The speed with which this unit penetrated the hard and broken rock overlying the coal strata made an immediate "hit"—and its ability to quickly change over to straight rotary drilling for the shales and less abrasive formations made it even more desirable. The investment proved so profitable that *two more* TRUCM units were purchased on Feb. 3, 1956—and still *another*, on Nov. 2, 1956! This fleet of four rugged and highly mobile units proved the ideal solution to all jobs where frequent over-the-road movements were required. And for the large stripping operations, where one drill could be kept on the job most of the time, two crawler-mounted DM-3 Drillmasters were added on Aug. 8, 1957. All *six* of these heavy-duty blast hole drilling rigs are equipped with I-R **DOWNHOLE** drills and long-lasting Carset Bits—an unbeatable combination for lower cost per foot of hole.



**C. S. Garber and Sons**  
Boyertown, Pa.

This contract driller purchased his first TRUCM Drillmaster unit on Jan. 25, 1955—primarily for blast-hole drilling on quarry jobs where fast moves were required from one quarry to another. Equipped with the I-R **DOWNHOLE** drill, it set entirely new standards of performance and costs. Then they tried it on a *water well job*—with such phenomenal success that *another* TRUCM unit was ordered on March 23—and *two more* on June 7 of the same year! The profit potential of these machines for water well drilling soon made this a major use of the **DOWNHOLE** drill, and business boomed to the point that *two additional* TRUCM units were added to the Drillmaster fleet—in April and July of 1957. Today, these *six* I-R Drillmasters, with I-R **DOWNHOLE** drills, are meeting all requirements for a greatly increased business in both quarry and water well work—an increased work load for which the machines are largely responsible. The ruggedness and roadability of the TRUCM mounting makes it ideal for contract drilling where you're here one day—and miles away the next.



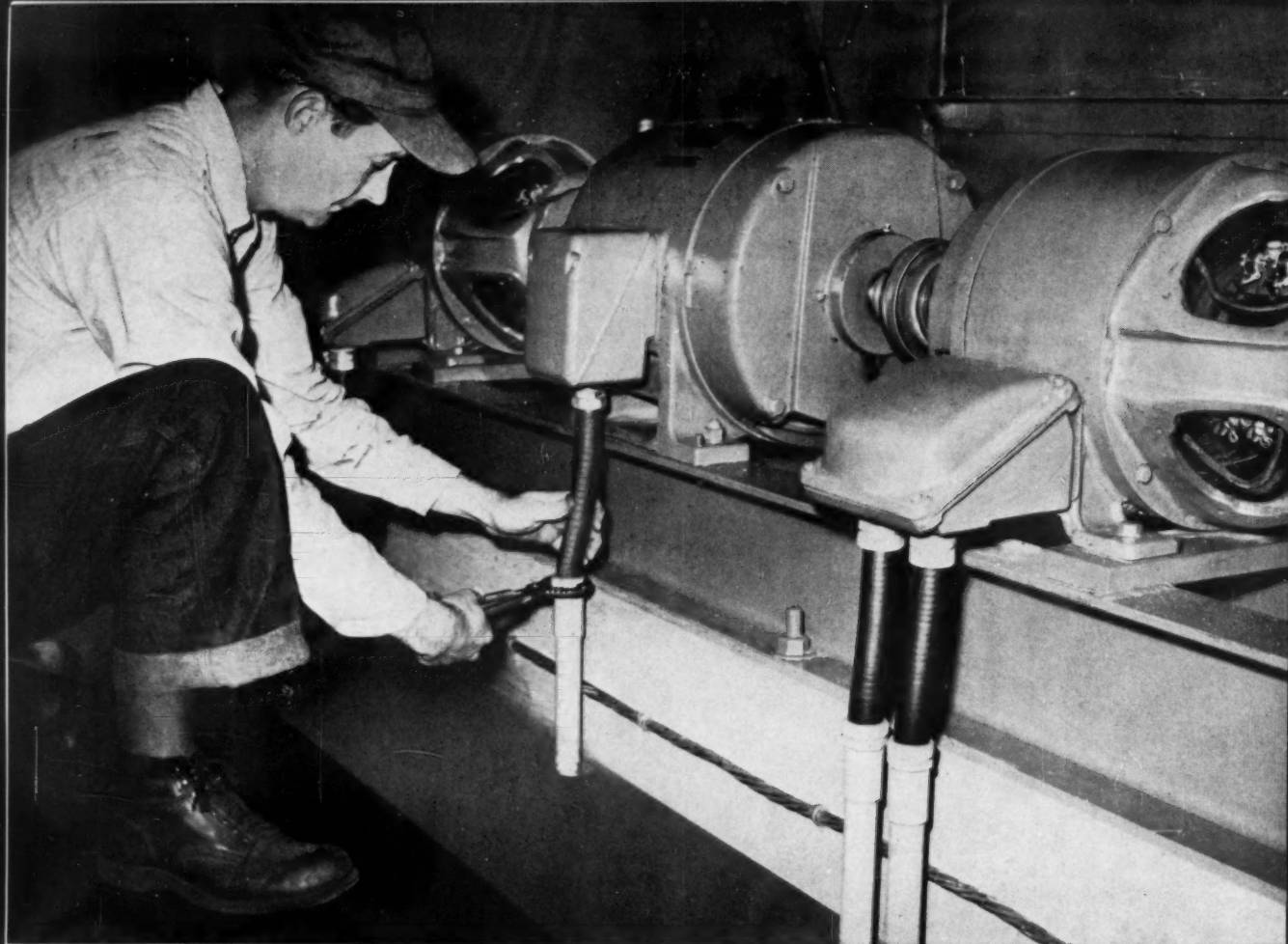
**New Jersey Drilling Co.**  
Madison, N. J.

Today, this company is one of the largest and most successful contract drillers in the State—operating a fleet of *six* I-R Drillmasters for both quarry and water well work. This "success story" really began only a little over three years ago. On May 25, 1955, to be exact—the date on which they purchased their first DM-2 crawler-mounted Drillmaster with I-R **DOWNHOLE** drill. Here, too, it was used initially for blast hole work in quarries—then applied to water well drilling. This proved so profitable that *another* DM-2 was purchased on Nov. 9, 1955. And in April, 1956, a TRUCM unit was obtained for use solely as a high-speed, highly mobile water well drilling rig. As business and profits increased, *two more* DM-2s were purchased—in July and August of 1956. And on Sept. 17, 1957, the entirely new TRUCM-3 unit, on I-R's specially designed Crane Carrier vehicle, completed the present Drillmaster fleet. All six units use the I-R **DOWNHOLE** drill—the ideal setup for hard rock water well drilling. To prove the point, one TRUCM-3 unit drilled 50 wells in granite in 3 months, averaging 100' per day.



**Ingersoll-Rand**  
5-866 11 Broadway, New York 4, N. Y.

A CONSTANT STANDARD OF QUALITY IN EVERYTHING YOU NEED FOR DRILLING ROCK



Sealtite, attached to a Speed Regulating Amplidyne MG set, is connected to conduit embedded in concrete. Control wiring leads to rectifier.

*For Atlantic Steel Company . . .*

## **Flexible, liquid-tight Sealtite conduit cuts parts replacement down-time in half!**

Sealtite's flexibility makes any parts-replacement job quick and easy—especially in cramped quarters. For the Atlantic Steel Company, Atlanta, Georgia, it meant cutting their down-time in half.

But this is only one way in which Sealtite can help you save. Where there's vibration to be absorbed, where the conduit must flex or be moved or meet misaligned outlets—Sealtite is ideal.

It costs less to install. It often outlasts unprotected rigid conduit. Sealtite has a tough extruded polyvinyl jacket that resists moisture, oil, dirt.

**WHERE TO GET SEALTITE**—Electrical wholesalers stock Types U.A. and E.F.† Sealtite in easy-to-handle coils, in black or gray. Be certain you ask for and get the quality conduit marked "Sealtite" on the cover. Buy it in long lengths on reels or in cartons and cut it on the job without waste. Your wholesaler also stocks liquid-tight connectors. Free Booklet S-539 gives full information on Sealtite. Write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. Sealtite is approved by Canadian Standards Association.

25181 Rev.  
†Pat. Applied For



**CUTAWAY SECTION** of Type U.A. Sealtite shows tough polyvinyl jacket over flexible metal core. Copper conductor wound spirally inside conduit gives positive ground.

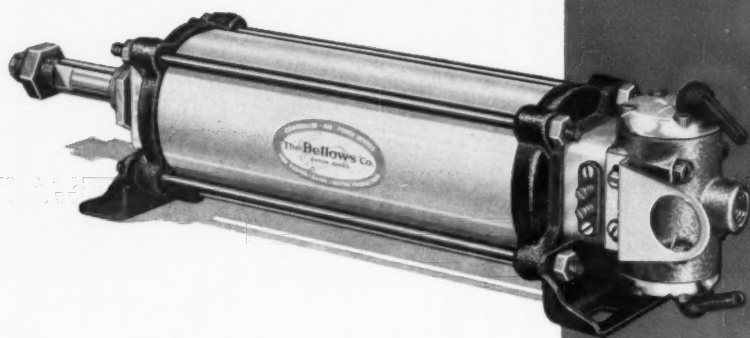
*Insist on  
the conduit marked*

# **SEALTITE®**

**FLEXIBLE, LIQUID-TIGHT CONDUIT**

*an* **ANACONDA®** *product*

# the ultimate in air cylinder power-



**BUILT-IN  
ELECTRICALLY-CONTROLLED  
DIRECTIONAL VALVE**

**BUILT-IN  
DUAL SPEED CONTROLS**

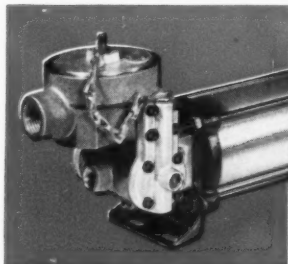
**REQUIRES ONLY A  
SINGLE AIR CONNECTION**

## THE BELLOWS AIR MOTOR

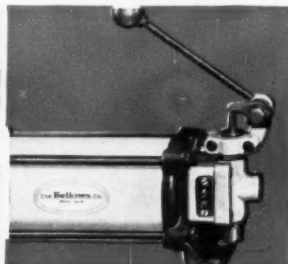
The Bellows Air Motor is a complete air cylinder power unit, with directional valve and speed controls built-in. Takes less than half the space and costs less installed than a conventional air cylinder set-up of equal power with its separate valving and piping. The single air connection, which can be made with flexible hose, makes it ideal for use on moving machine elements. It is a sturdy unit with forged steel heads, heavy brass cylinder, stainless steel piston rod. The piston rod is

threaded, equipped with a wrench flat and nut. Many Bellows Air Motors have been operating day in and day out for fifteen years with negligible maintenance. And if service needs do arise, there is a Bellows Field engineer as near as your phone. The Bellows Air Motor shown above is a 2½" bore unit equipped with the Bellows Low-Voltage (8-12V) Electroaire Valve. Other bores available are 1¼", 1¾", 3⅝" and 4½". Any stroke length. Optional choice of built-in valves as shown below.

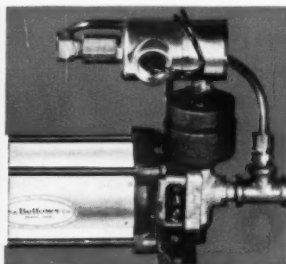
### CHOICE OF BUILT-IN VALVES



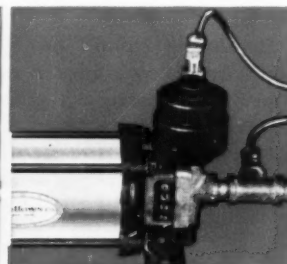
**115 V. ELECTROAIRE VALVE**  
For J.I.C. applications where a 115 v. momentary contact is desirable.



**MECHANICAL VALVE**  
For manual operation or for use with cams or direct linkage.



**115 V. MAINTAINED CONTACT**  
Valve remains in shifted position during period current is applied.



**AIR-OPERATED**  
For use in applications calling for full pneumatic control.



**Write for  
these two booklets**

Fifty pages of data to help you select the right Air Motor-Valve combination for your job. Address Dept. CA-1058 The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto 18. Ask for Bulletins BM-25 and SP-55.

## The Bellows Co.

DIVISION INTERNATIONAL BASIC ECONOMY CORPORATION

**AKRON 9, OHIO**

983-B

# Biting through 22 ft of Abrasive Limestone

This drilling rig, equipped with Bethlehem Hollow Drill Steel, is putting down 3½-in. diam blast holes as deep as 18 ft in a quarry at Bowmansville, N. Y., operated by Buffalo Crushed Stone Corp., a unit of Houdaille Industries, Inc. The limestone, for use in construction projects, is being drilled economically with 2-in. round Bethlehem Hollow, fitted with carbide-insert bits. Reconditioning is done by Niagara Bit and DrillSteel Corp., North Tonawanda, N.Y.

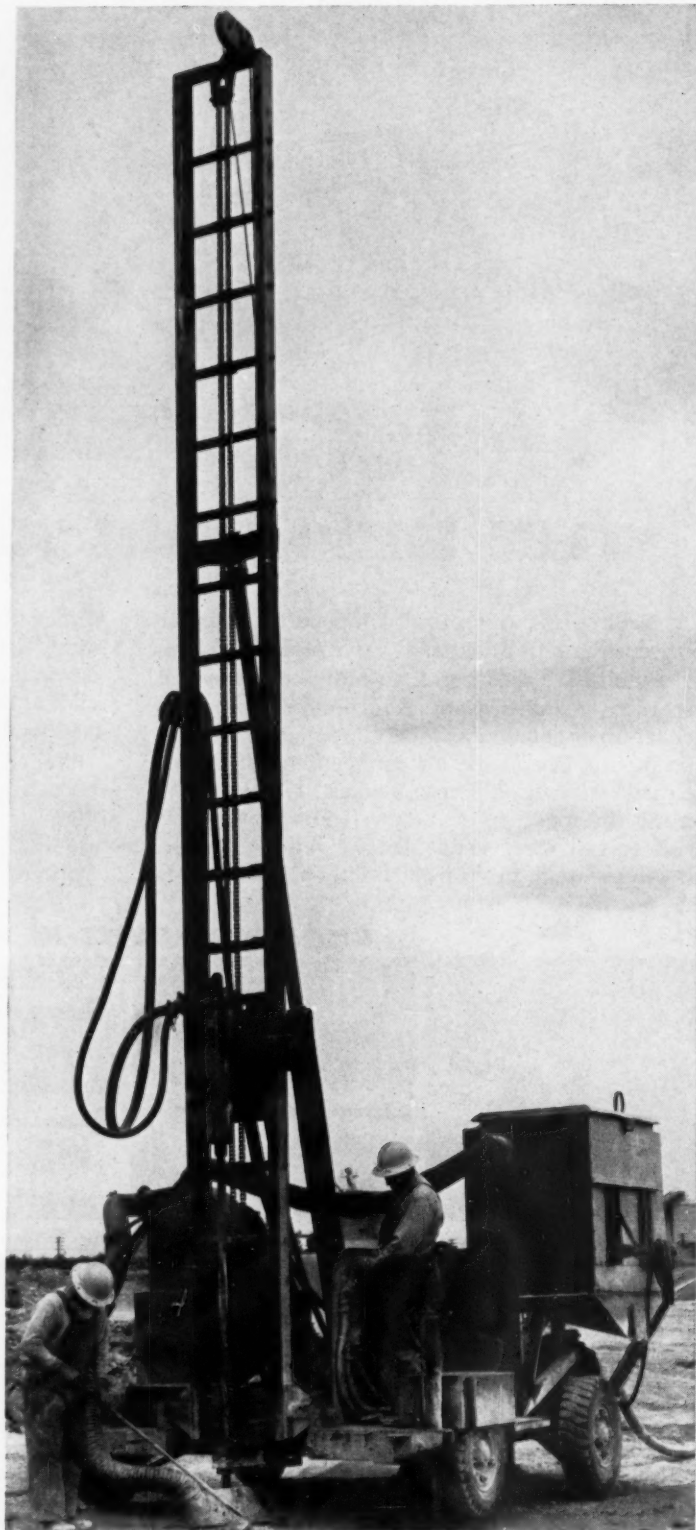
Any type of rock drilling, regardless of the type of formation, can be drilled with minimum breakage when you use Bethlehem Hollow. This is because it's rolled from a special fatigue-resistant steel. It has a uniformly round hole, centrally located in the bar, and a wide quenching range. It can be heat-treated easily for the proper balance of toughness and wear-resistance. The result: durable threads and shanks.

Bethlehem Hollow comes in Carbon and Ultra-Alloy grades in rounds, hexagons, and quarter-octagons. Standard lengths range from 18 to 27 ft. Longer lengths can also be supplied. Specify Bethlehem Hollow for your next rock drilling project.

.....  
Drilling rig, equipped with Bethlehem Hollow Drill Steel, making blast holes at limestone quarry of Buffalo Crushed Stone Corp., Bowmansville, N. Y. ▶

**BETHLEHEM STEEL COMPANY  
BETHLEHEM, PA.**

On the Pacific Coast Bethlehem products are sold by  
Bethlehem Pacific Coast Steel Corporation. Export  
Distributor: Bethlehem Steel Export Corporation



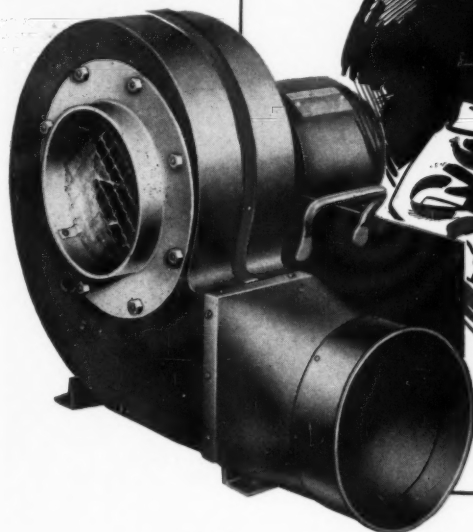
**BETHLEHEM HOLLOW DRILL STEEL** CARBON AND  
ULTRA-ALLOY

ANOTHER  
**COPPUS**  
"BLUE RIBBON" PRODUCT

This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.



This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.



## *These are the cost-reducing Blowers that give up to 100% more air*

Only Coppus makes both types—and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

*Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters*

*for special purposes. See also THOMAS' REGISTER . . .  
Coppus Engineering Corp., Worcester 2, Mass.*

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210 Park Avenue, Worcester 2, Mass.

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Company.....

Address.....

**Specify  
NAYLOR  
Spiralweld  
PIPE**

**EASY to  
Handle and  
Install**

**Strong  
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**FASTER  
Connections  
with NAYLOR  
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**Sizes  
from 4"  
to 30"**

**WRITE for  
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1245 East 92nd Street, Chicago 19, Illinois

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## TYPICAL SCHRADER SIMPLIFIED VALVE DESIGN

.. another reason why your air system installations will perform best.

**A**—Mounting holes always conveniently located.

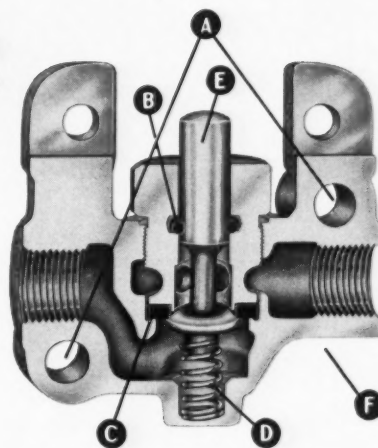
**B**—"O" rings used for surest airtight seal.

**C**—Oil-resistant synthetic rubber used in washers for positive leakproof seat.

**D**—Stainless steel springs: rust resistance, longest service life.

**E**—Sturdy plated plungers, quick acting, smooth-operating.

**F**—All parts designed for greatest air flow, longest life and simplicity of replacement and interchangeability.



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**3-WAY SINGLE SOLENOID VALVES**

**4-WAY DOUBLE OR SINGLE SOLENOID VALVES (Sub-Base)**

**4-WAY VALVES (Hand, Lockdown)**

**4-WAY VALVES (Pilot Operated)**

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#### ENGINE-TRANSMISSION ASSEMBLY

Many multiple-spindle nut runners and automatic assembly machines are in use throughout the giant Lansing works. The operation shown here is one in which a Hydra-Matic transmission is fastened to an engine. The unit, equipped with Ingersoll-Rand air motors, holds the transmission. An air cylinder, visible as the support mechanism, serves to position it in relation to the engine. Four spindles are utilized. An 8-compressor air plant, with a total capacity of 29,500 cfm, serves the Lansing main plant with air at 100 psig.

## Building The Rocket Engine

R. J. Nemmers

### *Oldsmobile's Famed Engine Is Assembled On A Unique Line With Advanced Air-Powered Assembly Machines*

**O**LDSMOBILE Division, General Motors Corporation, has built 3.5 million of the various models of the high-compression, high-performance, V-8 engine known through 10 model years as the *Rocket*. So popular is this power plant, as well as the famed Hydra-Matic drive and the styling of the entire car, that the merry Olds has almost consistently maintained and/or improved its standing in the highly competitive automobile sales field since the engine's introduction in 1948. Production capacity of the engine has grown from 30 per hour in 1949 to 150 per hour at the present. As for the engine itself, its quality, weight-to-horsepower ratio, performance and horsepower are all considerably advanced.

Modern, multiple-spindle, automatic assembly machines; an industry-first camshaft inserter; a modern transfer machine, that differs as greatly from the moving assembly lines of the 1920's as do car models; and a variety of other automatic devices, grace the present *Rocket* assembly line. Although many of the automatic machines have helped to increase production rates and reduce costs, perhaps the most outstanding feature of them all is that they have improved the over-all quality of the engines. Further, most have simplified difficult manual operations through pneumatic, hydraulic and mechanical aids. In other words, the machines do

repetitive tasks with a precision and uniformity such that the end product varies only slightly from piece to piece.

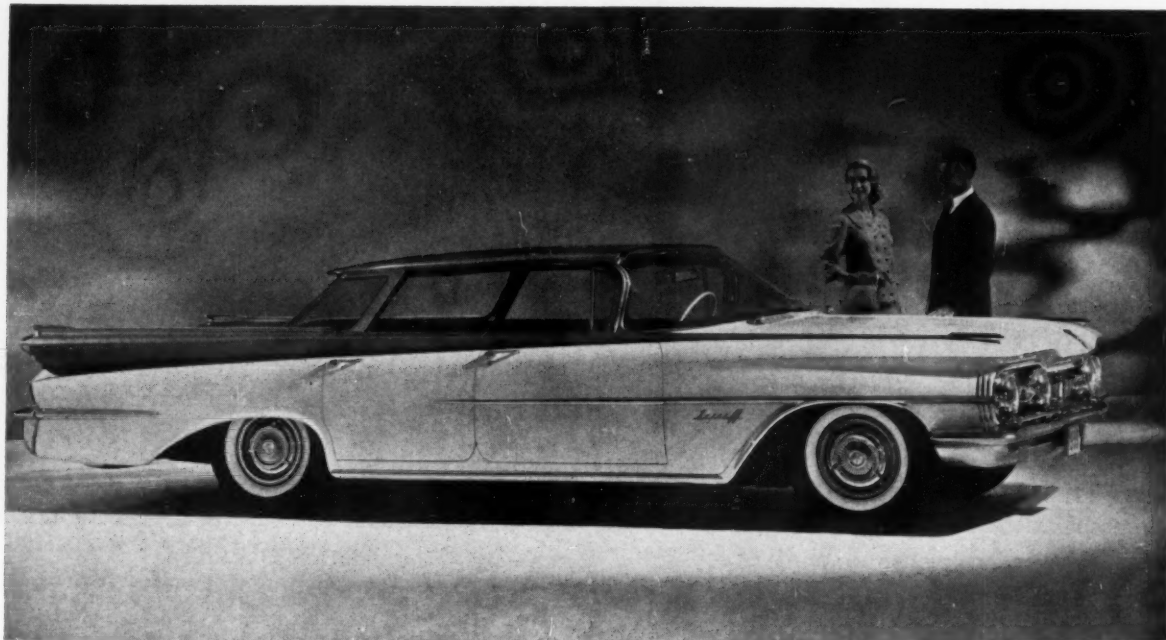
This uniformity of action, on the part of the mechanical aids to production, makes possible the use of statistical quality control methods to maintain the high standards of the *Rocket* engine.

To design and build a single machine of high quality requires extensive research, careful manufacturing and assembly, and rigid testing. To build thousands of identical machines, and attain the same high level of quality on each, compounds the problems manifold. If it is to be done at an economical cost, it is obvious that variables in manufacturing must be reduced to a minimum. It is the function of statistical quality control to point out operations in which critical dimensions or values are drifting away from prescribed tolerance ranges. By pointing out these variations, steps can be taken to correct the situation before defective parts are produced or assemblies made.

Machine tools having the capacity to reproduce many products over and over again within narrow tolerances are nothing new in this age and Oldsmobile has its share of these wonderfully precise mechanisms—and the skilled employees to see that they deliver all the precision of which they are capable. It is in the field of assembling engines that Oldsmobile now leads. Regardless of the

precision of manufacturing operations, a mechanical product won't be of top quality if it is not put together correctly. Proper assembly encompasses a great deal more than just putting the right pieces together and having everything in its assigned place. There are tolerances in assembly too, and the statistical quality control that works so well with machining and finishing steps can be effectively applied to procedures dealing with putting things together.

Control of bolt, stud or cap-screw tension is one phase of assembly that cannot be over emphasized. The metal of which the fasteners are made, like all materials, is elastic—it will stretch under load. In many ways fasteners can be compared to springs, and putting two pieces of metal together with a threaded fastener is analogous to clamping them together with a spring. For example, if two 10x10-inch steel blocks are held together with a spring exerting a force of 100 pounds per square inch over their area of contact, it will take a force of something more than 10,000 pounds to separate them. Furthermore, it will take a force greater than the coefficient of friction between the two blocks, enhanced by the pressure of the spring loading, to cause the blocks to slip or move in shear. Putting the same two blocks together by means of a threaded fastener so that the same conditions will be realized, calls for the preloading,



1959 OLDSMOBILE SUPER 88 SPORTSEDAN

or tensioning, of the bolt so than an equivalent 100-pound-per-square-inch pressure will be exerted.

At the present stage of fastener technology, there is no economically practicable method of measuring bolt tension directly. It can be arrived at indirectly by measuring the torque required to turn the nut or cap screw. Theoretically, if all conditions were the same, a given torque would always develop a given bolt tension; unfortunately, they are not always the same. If a bolt is of, say, nominal  $\frac{3}{4}$ -inch size, it may be a few thousands of an inch larger or smaller. The same is true for nuts. If a large bolt and small nut are put together, it might require extra torque to produce a given tension. If a small bolt and large nut are used, the reverse may be true. The coefficient of friction between the head of, say, a cap screw and its seat, also varies, thus introducing another uncertainty.

By taking all of the uncertainties into consideration, a range of tolerances can be derived: a low torque, below which it is unlikely that all fasteners will develop the required tension, and a high one, above which it is likely that fasteners will be overstressed—stretched beyond the limit of elasticity. Thus, to maintain the desired standards, it is necessary that fasteners be torqued to within the given range. In the multiple-spindle assembly machines at Oldsmobile, this control of torque is achieved by regulating the pressure of the air powering the individual pneumatic tools that make up the unit. The air wrenches then are run until they stall.

## 61 Years For The Merry Olds

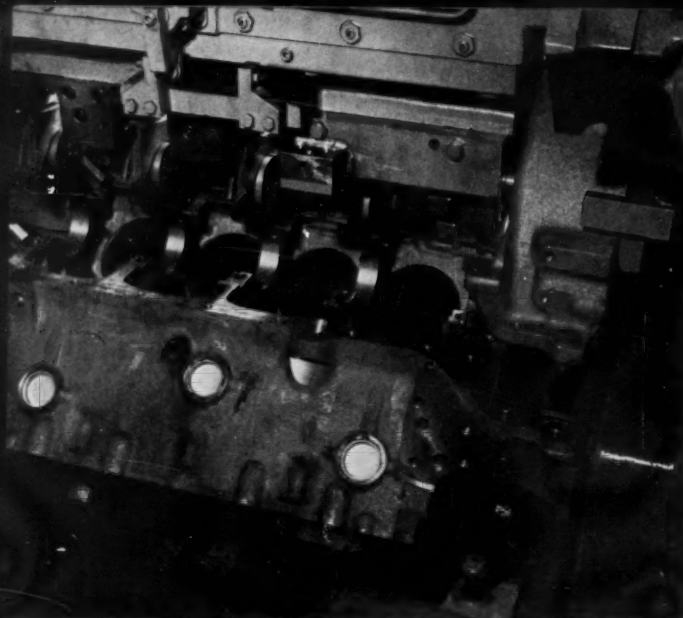
OLDSMOBILE is the oldest manufacturer of passenger cars in the automotive industry. The Olds Motor Vehicle Company was organized in 1897 at Lansing, Mich., by R. E. Olds and Frank Clark. Four cars were built that year, one now in The Smithsonian Institution. The story began in 1895 when the two young men started construction of the first Oldsmobile, Clark furnishing the carriage and Olds the engine and other mechanical parts.

That early company didn't do too well, however, because few of the public had any faith in automobiles. The corporate name continued to 1899, when the Olds Motor Works was organized in Detroit, with R. E. Olds as general manager. Here, the curved-dash runabout was developed. With a 66-inch wheelbase, the vehicle weighed 700 pounds and was powered by a 1-cylinder, 7-hp horizontal engine. It had two gear speeds and a 5-gallon fuel tank. This car was the first to be built on a progressive assembly system—the cars were placed on caster-mounted wooden platforms and pulled from operation to operation. The volume-production idea paid off, and in 1901 a total of 425 cars were built. This jumped to 3750 in 1902, 5000 in 1903 and 5508 in 1904. In March of 1901, the Detroit plant burned, and the firm accepted a 52-acre site from

the City of Lansing, returning to the city of its birth.

The Olds Motor Company joined General Motors (Buick) in November 1908. The Oldsmobile Division pioneered a great many innovations for the parent company and the industry. In 1925 for example, chrome-plated trim was introduced. The first fully automatic choke was born in a 1932 Olds, and the Hydra-Matic transmission, first of the fully automatics, appeared in 1939. The *Rocket* engine, the industry's first post-war high-compression power plant, appeared in 1948. In November 1955, the three millionth Hydra-Matic-equipped vehicle was produced; and in October 1957, the six millionth Olds. In 1955, the firm installed the industry's first pneumatic multiple-spindle machine for running head bolts. The three-millionth *Rocket* engine was assembled in February 1957, and the four millionth Oldsmobile with Hydra-Matic drive rolled off the assembly line April 8 of this year.

The picture at the top of this page shows the 1959 Super 88 Sportsedan. All of the 1959 models are distinguished by the extremely thin roof line as shown in the illustration. The exterior boasts the latest sculptured effect and the high-compression *Rocket* engine under the hood has more than 3,500,000 ancestors.



### LIFTING BEARING CAPS

Blocks are machined with the main bearing caps and fly-wheel housing in place and with their fasteners torqued to final specifications. Prior to assembling the engine, they are removed, but care must be taken to see that the bearing caps are returned in proper order. An Ingersoll-Rand ZC14A-1 multiple-spindle run-out machine loosens the fourteen cap screws involved, and then the machine shown in this view picks up the caps and housing and places them on a conveyor jig. The latter rides a mono-rail parallel to the main line and rejoins it after the crankshaft is put into place.

Assembly of the *Rocket* engine is carried out on what amounts to two lines—one, a transfer type, on which the engine is upside down for the insertion of the crank, cam, pistons and rods, etc.; and the other, a continuously moving one, on which the engine is turned upright for the addition of heads, exhaust and intake manifolds, and the like. The basic difference between a continuously moving line and a transfer type, is that the latter moves the block in steps, pausing at stations momentarily while a certain operation is performed. Continuously moving lines, as their name would indicate, carry a block through a given station at a speed that enables all assigned jobs to be accomplished during transit.

In many respects, the transfer-type line can be thought of as a single machine. It incorporates manual, semi-automatic and automatic operations, its design taking into consideration not only the mechanical practicality of a step, but its cost economy as well. Oldsmobile methods engineers feel that there is certainly no economy in replacing a manual operation if the mechanized version results in a more costly, less efficient one. In addition, design of the machine had to take into account any changes in engine design that might occur during the economic life of the equipment.

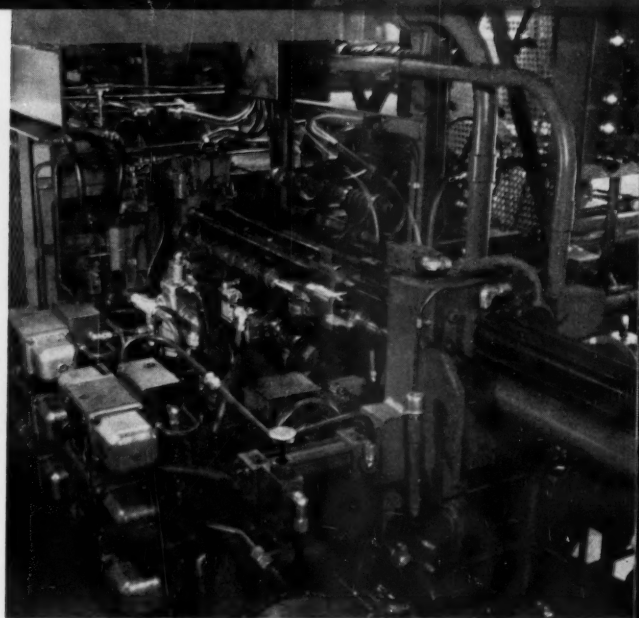
The basic machine making up the line is a Natco conveyor. It uses what can be described as a "reach-and-pull" ac-

tion to move the assemblies: engaging arms are extended by hydraulic cylinders, retractable fingers reach up through the assembly slides engaging the block, and then the arms are retracted pulling the block forward. At the end of the cycle, the fingers retract in readiness for the next cycle, which is initiated by a master timing device controlling all movements along the transfer assembly line.

To illustrate the individual operations, a *Rocket* engine can be followed from start to finish, exclusive of machining steps and mentioning only in passing some of the subassemblies put together on other lines.

Just ahead of the Natco line is a short parallel one on which flex plates are attached to the crankshaft, the fasteners being run by means of a 6-spindle handheld nut runner. The crank is then relayed to balancing machines where mass is added or deleted to assure a smooth-running engine.

Simultaneously, machined cylinder blocks with the main bearing caps attached are brought to the line on a conveyor system and released to a roller-conveyor storage or float area. This float area compensates for irregularities in delivery of blocks, or in their passage through the assembly operations. At this point, an operator keys each block on a teletypewriter, indicating for each the size of the eight bores. Operations on the main line and some subassembly



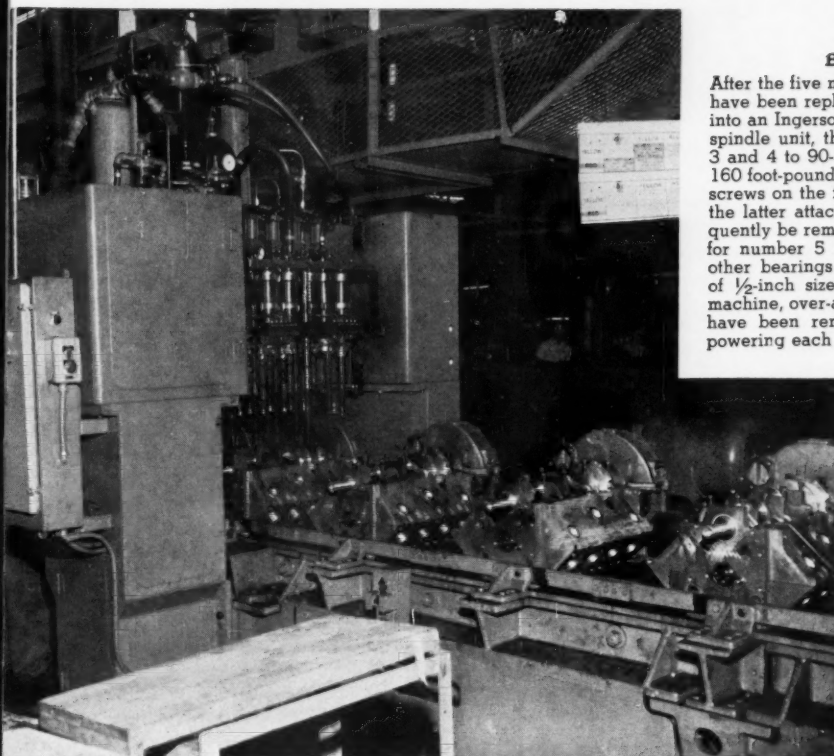
### CAMSHAFT INSERTING

Shown in this illustration is the Olds camshaft inserting machine—the first automatic camshaft positioning device in the industry. The shafts are brought to the machine by the chain conveyor feeding in from the top right. A guide pin passing through the engine locates the geared end of the shaft and a floating follower engages the other end (foreground). By an intricate arrangement of hydraulic cylinders and controls, the camshaft is exactly aligned with the block and gently pressed into place. The key to the successful operation of the A. E. Parker unit is the guide shoe design by means of which the camshaft is guided.

lines are scheduled by the teletypewriter messages.

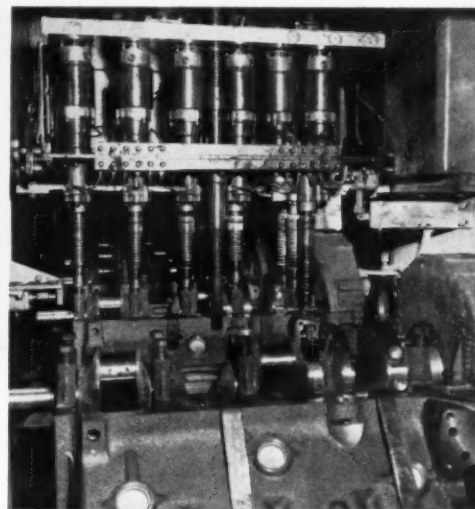
Actual assembly starts as the block is delivered from the float area to a washer where it is degreased. As it is discharged, the block is engaged by the Natco transfer machine which carries it forward to the first operation. Here an Ingersoll-Rand 14-spindle "nut cracker," or run-out machine, loosens the cap screws holding on the five main bearing caps as well as the flywheel housing. The block is positioned under the I-R unit by the transfer clogs. When the block is in position, the master timer initiates the run-out cycle; the spindles lowering automatically, engaging the cap screws and loosening them. At the end of the timed period, the spindles lift, kick-out bars ejecting the cap screws from the sockets so that they remain loosely implanted in the caps and housing. The transfer machine then carries the block forward one step, and a Natco automatic lift engages the bearing caps and the fly-wheel housing and sets them on a holding fixture. The fixture travels parallel to the main line on a monorail conveyor that delivers it to the reassembly point after the crank is positioned.

The next major station on the line is the automatic camshaft-inserting machine. Formerly, when the job was done by hand, there was always some risk of slight misalignment of the shaft when sliding it through the bearing line. Because the extreme diameter of the cam



#### BEARING CAP ASSEMBLY

After the five main bearing caps and the flywheel housing have been replaced—a manual operation—the block goes into an Ingersoll-Rand ZC12A-1 assembly machine. A 12-spindle unit, the rig torques capscrews on bearings 1, 2, 3 and 4 to 90-120 foot-pounds, and on number 5, to 140-160 foot-pounds. It also tightens two of four retaining capscrews on the flywheel housing. Torque is not critical on the latter attachment at this point because it must subsequently be removed for further operations. The capscrews for number 5 bearing are  $\frac{9}{16}$  inch in diameter—for the other bearings and flywheel housing, the capscrews are of  $\frac{1}{2}$ -inch size. These photographs show the assembly machine, over-all and close-up. In both cases, cover panels have been removed to show the individual air motors powering each spindle.



lobes is almost as large as the bearing, the misalignment would score these bab-bitted surfaces. With the automatic machine, a power-operated floating pilot bar that engages the cam shaft is run through the bearings exactly lining up the cam with the block, regardless of minute variations in the position of the block. After the pilot bar engages the cam, a power cylinder, equipped with a free-floating pusher head, or guide shoe, so that the tail of the shaft is free to follow the alignment imposed by the pilot bar, pushes the camshaft into the engine. As an example of the precision job the machine does, Oldsmobile methods engineers point out that with the previously used method, the cam could rarely be turned by hand after assembly; now it turns almost without friction and can readily be spun with the fingers indicating that bearings are not scored at all.

Engine designers believe that one of the most important elements of engine assembly is a precision fit in the main bearings. Assuming proper balance of rotating and reciprocating parts, such fits govern the smooth running qualities of the finished product. To achieve this end, Oldsmobile utilizes selective fits on three of the five main bearings. There are five possible selections for bearing No. 1 and three for Nos. 2 and 5. (Bearings are numbered from front to back as the engine is positioned in the automobile.) To make these fits, Olds meth-

ods engineers have worked out a unique air-powered selector mechanism that helps eliminate the possibility of errors on the part of the bearing fitters. The block and the crankshaft are color coded to indicate the exact sizes of the various bores and diameters. To select the proper bearing shells, the fitter presses corresponding colored buttons on a solenoid-valve control panel. Through an intricate piping network, air flows to tiny air-cylinders that open doors presenting the proper shell to the fitter.

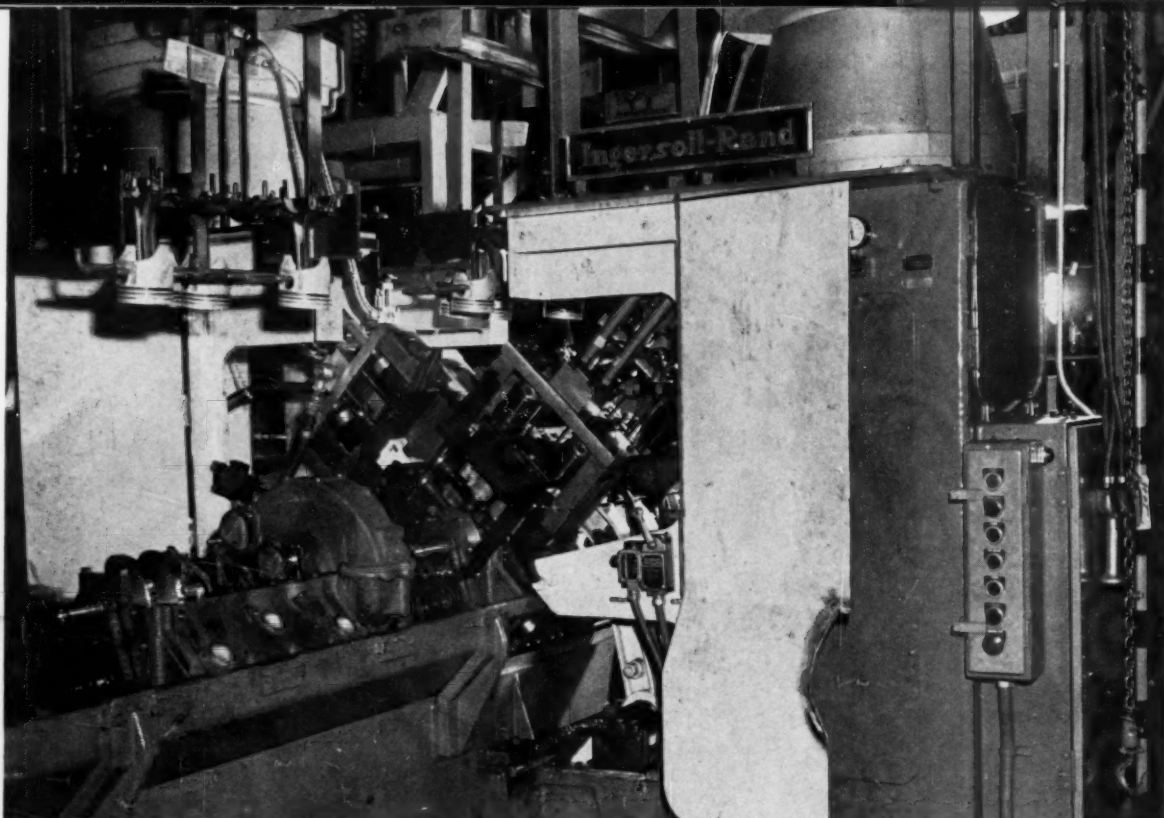
Crankshaft assembly is also automatic. Crankshafts are mechanically removed from carriers on a power-and-free monorail conveyor and automatically positioned in the engine blocks. Here again, the quality has been improved because the machine sets the crank more gently and precisely into the bearing shells than can possibly be done by manual methods.

After the crank is positioned, the transfer machine moves the blocks to a station where the bearing caps and the flywheel housing are manually replaced in the same order in which they were removed. Then the blocks are carried into an Ingersoll-Rand 12-spindle assembly machine where the bearing cap screws are automatically torqued to specifications (Nos. 1 through 4, to 90-120 foot-pounds; and No. 5, to 140-160 foot-pounds) and two of the four flywheel retaining screws are run up snug. The latter must be subsequently removed

for other assembly operations, so their torque is not closely regulated. The individual air motors making up the head of this assembly machine are self-checking for minimum torque. The motors are free to rotate within a short arc, and attached to each is a short, spring-loaded reaction arm. Assuming that all of the cap screws meet the minimum torque requirements, the individual reaction arms bear against contact switches completing a circuit that sprays a blob of paint on the block. If, for any such reason as a broken screw, a screw on which threads did not engage or on which threads have stripped, the reaction arm on the motor powering that spindle fails to make contact, the blob of paint will not appear on the block, and inspectors checking the engines will know that something is wrong with the bearing cap screws. The spray mechanism fails safe—in other words, if it fails in itself, the engine is checked over as a matter of course.

At the next several stations, cam timing gears and chains are assembled and other details taken care of, including careful inspection of all steps to that point.

The next step is installation of the pistons and rods. The pistons, too, are



#### ROD ASSEMBLY MACHINE

Shown here is one of two duplicate Ingersoll-Rand ZC4E-1 assembly machines that feed nuts to the connecting rod bolts and run them to 35-40 foot-pounds torque. For running the nuts down, only a 7-foot-pound torque is exerted, thus assuring that threads will not be stripped if the nut

is started with a crossed thread. Air pressure is then increased for a timed interval, and the nuts are turned home at full torque. Above the block can be seen the monorail conveyor carrying the remaining four piston assemblies for insertion in the next step.

selectively fitted, but the job is done on the piston assembly line. The teletypewriter message from the controller at the start of the line contained a coded message detailing cylinder bore sizes. Piston sets were made up to these specifications and positioned on a carrier in the order of installation.

As the block nears the piston assembly station, it pauses at a crank-positioning device which turns the crankshaft so that when the rods and pistons are placed, the entire assembly will be lined up with an automatic nut runner that assembles the rod nuts. The crank and cylinders are also lightly sprayed with oil to facilitate assembly. Next, four pistons are placed, two on each side, the other four being placed in subsequent steps.

Pistons are started into the bores manually by operators who place bolt protectors over the bolts on the rods, remove them from the carrier, and assemble the piston and rod into the block using a solid-collar-type ring compressor.

Next the operators manually place the rod caps over the bolts, and the next cycle of the transfer machine carries the assembly into an Ingersoll-Rand 8-spindle machine. This unit feeds the connecting-rod nuts and automatically

torques them to a final value of 35-40 foot-pounds. To assure that no nuts are cross-threaded in this operation, the air supply to the machine is regulated so that at first but 7 foot-pounds torque is applied to the spindles, thus turning the nuts down very slowly. This avoids the possibility of stripping the threads because the available power is not sufficient to turn the nut if threads are crossed, and consequently, of making up an assembly that looks and tests satisfactorily, but that later might fail. After a timed interval, air to the machine is shut off momentarily and is then automatically turned on again for a short timed-interval at a pressure that seats the nuts securely at the final torque.

As the engines leave this assembly machine, the crankshaft is repositioned and the remaining four piston-and-rod assemblies are put in as before. The block then enters another I-R connecting-rod-nut assembly machine that, with the exception of the positioning of the spindles, is a duplicate of the first. The engine leaves the Natco transfer line after this step and is fed to a pallet conveyor. Here, the engines pass an inspection and repair station where any faults are eliminated. As the engines leave this section, they pass, one by one, through a Planet roll-over device designed to remove any

nuts or other items that may have dropped into the engine. The device is loaded by an air-cylinder-powered transfer bar. The rig is hydraulically powered and has two distinct motions. First the engine is turned 180 degrees in the vertical plane and brought to an abrupt halt. This serves to jar loose any foreign matter that might be lightly wedged in place. The block then continues in the same direction another 540 degrees.

On leaving the roll-over rig, the block enters a float area. A small number of engines lie on a Roller Flyte conveyor that feeds them to the next step, and any additional engines that build up on the line, because of the slightly higher cycle rate of the transfer section of the line, are automatically transferred into one of six gravity roller storage conveyors. Conversely, if the first part of the line is closed down for any reason, the engines are returned to the line by an I-R Air Bloc hoist so that subsequent operations are not slowed.

At the end of the Roller Flyte conveyor, engines are automatically placed on horseshoe yokes by another air-operated machine for transfer to the continuously moving portion of the assembly line. As the engines come down the conveyor, they feed onto an air-cylinder lift that projects the assembly

up to clear the arms of the yoke. As the yoke moves around the block, the cylinder gently retracts, setting the engine on the carrier. The yokes travel on a monorail conveyor to the start of the continuous line, and there, with the aid of another Air Bloc, deposit the engines, still inverted, on the fixtures that travel along the line.

The first operation is to attach the front cover assembly which consists of the water pump and timing gear cover, etc. This is done with a manually positioned 8-spindle multiple nut runner. Next, an 18-spindle nut setter attaches the oil pan. These steps complete the work on the engine in the inverted position, and the next step is to turn it over. Again, air power is utilized. A yoke is suspended from an overhead lift cylinder. This is used to pick the engine from its fixture. Once grasped in the yoke, a small air motor turns the mechanism, through a mechanical geared linkage, 180 degrees in its vertical plane. Then, the engine is set down upon its fixture again.

The next step is to attach the water pump drive pulley to the crank. A single fastener is run down with a hand-held air tool. After the nut is snug, the operator keeps the tool engaged, thus cranking over the engine. This assures that all parts are moving freely and serves as a further check on previous operations.

Heads are added in the next work

area. They are received from their sub-assembly line with spark plugs installed, are lifted from their conveyor carriers by Air Blocs and set into place. Overhead-suspended, manually controlled I-R multiple nut runners tighten head bolts first on one side, and then duplicate units, on the other side of the line, are used for the opposing head. Because the head bolts are so closely spaced and socket clearances are tight, two nut runners are used on each side, the first having eight spindles, the second, ten. Torque on the critical head bolts is controlled between 55-75 foot-pounds.

The next step sees the utilization of a 2-spindle nut setter to fasten on the valve-lifter cover. This is unique because of the cut-off control used. Running the fasteners to a specified torque is not required; instead they must be tightened until the thin plate deflects. A small air valve with a contact rod following the cover plate is utilized. As the fasteners are run down, the cover deflects under the bolt loading, and the following, spring-loaded, contact rod trips the valve, cutting off the air supply to the machine.

Then, exhaust manifolds are installed, utilizing two 6-spindle multiple nut runners, one on each side. Subsequent steps see the addition of the distributor, wiring harness, studs for the carburetor, etc. Pneumatic tools of the hand-held variety find many uses in these operations, too.

Finally, the completed engine is sent

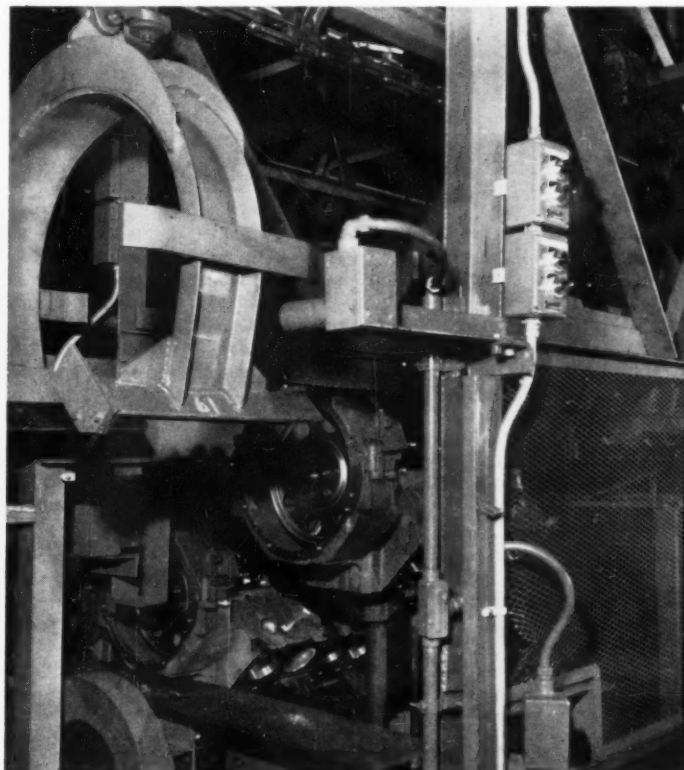
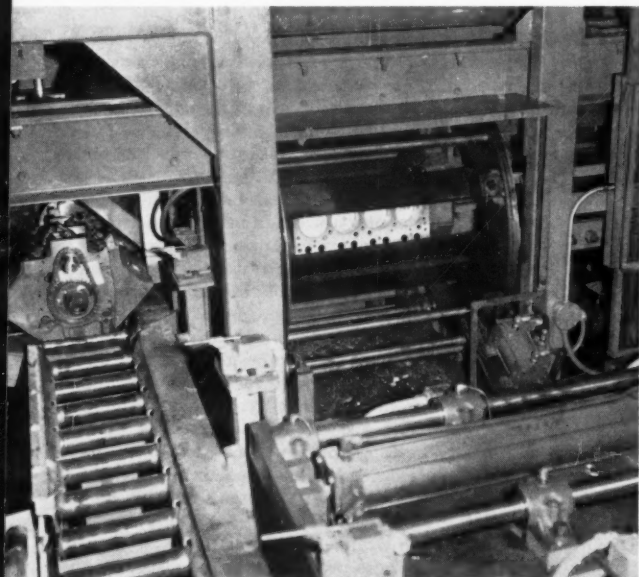
to the paint spray booth where it receives its customary coat of paint. The engines are then air dried and continue on to the hot-test cells where each undergoes a 10- to 13-minute run-in test. Approximately 3 minutes of this time are spent with the engine at idling speed, and the remainder, in the high operating ranges. During the run-in, water and oil pressures are carefully checked and final adjustments on the engine itself are made.

Some 28 varieties of engines are available, and each is built to order on the same assembly lines. For example, a given one may be equipped either for operation with Hydra-Matic or manual transmission, may have a 2- or 4-barrel carburetor, etc.

Thus, the high-horsepower, smooth-running *Rocket* engine is built. Visitors touring the Oldsmobile Lansing plant on the company-sponsored daily visits to the facility are often heard to remark that it is a miracle that everything arrives at the right place at the right time, that it all fits perfectly, and that the engines purr into life without even a sputter. Although it does indeed seem miraculous, the credit must go to engineering know-how, precise production planning and advanced methods engineering, as well as to some uncannily precise machines that do the same job over and over again, rarely causing even a ripple in the smooth curves of a quality control chart.

#### BLOCK HANDLING

Below is a view of the block roll-over device. A Planet unit, it turns a block 180 degrees, stops it abruptly (by means of the air-cylinder shot-pin device in the right foreground) to jar loose any foreign matter present, and then rolls it 540 degrees in the same direction. At the right is the air-operated lift device that automatically loads blocks onto a horseshoe-like yoke (left) for transfer to the continuously moving section of the assembly line.





#### MULTIPLE SAVINGS

Joseph Futch Construction Company, Exeter, Pa., cut costs on the job illustrated in these two photographs by using engineered form-tying devices and an Ingersoll-Rand 8U electric Impactool (left). Shown is one of two forms for reinforced concrete abutments on an overpass to span the Delaware, Lackawanna & Western Railroad tracks at Kingston, Pa. Each of the 265-foot-long abutments was held in place with ten thousand 1/2x16-inch lag screws (Tylags) tensioning the internal form-tying devices (Tyscrus). When securely tied, 2780 cubic yards of concrete was poured. It was estimated that the Impactool affected a savings for the contractor of about 580 man-hours—or an estimated total of more than \$1500. Richmond too realized a savings, for it has discovered that when the Tylags are returned to be credited to the user's account and reconditioned, that those handled by impact wrenches such as the 8U are generally in excellent condition, ready for reuse with slight or no reconditioning.

P. J. Colwell

*Richmond Screw Anchor Company, Inc.,\**

*Uses Compressed Air*

*To Good Advantage*

*In Making—*



## HARDWARE FOR CONCRETE

IN 1911, growing America was making severe demands of its building industry. The developments in new structural concepts were far ahead of techniques for implementing them. Concrete construction was plagued with antiquated practices that constituted serious impediments to progress. These conditions set the stage for the founding of Richmond Screw Anchor Company and its development into a fabricator of engineered devices for concrete construction.

Julian Richmond, a London-born and American-educated mechanical engineer, became acquainted with a French inventor named Thollier who had developed an effective device to attach rails to concrete ties. His idea utilized helixes of flattened wire cast in the ties and to which the rails were anchored by bolts or lag screws having threads matching

the helical coils. Richmond, then working as an engineer for the New York City Board of Water Supply, recognized a wide variety of applications for this product in the expanding concrete construction industry. He arranged to make and sell the Thollier coils in the United States.

Through his sales efforts in the construction field, Richmond's eyes were opened to other needs of the concrete builder. He discussed his observations with a friend, Samuel D. Dodge, also an engineer with the Board of Water Supply, and they noted the haphazard methods being used to secure concrete forms and make them rigid. This critical operation was often left to the improvisations of the job foremen who frequently had little knowledge of structural strength requirements. Richmond and Dodge visualized the potential savings to a builder were he provided with prefabricated form-tying devices. They

knew that a high degree of design standardization was possible, and that this indicated mass production. The two men formally established Richmond Screw Anchor Company, Inc., in 1918, launching their enterprise in a tiny shop in Brooklyn, N. Y.

Richmond and Dodge applied their ingenuity to a number of construction jobs, where they worked closely with the architects, engineers and craftsmen to design some of their early products. Some of these were given trade names, such as Snap-Ty and Tyscrus, forms of which have become generic. As additional needs were recognized, the product line expanded to include numerous metal accessories useful in the diverse facets of concrete construction. Today, Richmond Screw Anchor Company offers more than 350 items made in plants located at Brooklyn; St. Joseph, Mo.; and Orangeville, Canada.

These products may be placed in the

\*Controlled by Shattuck Denn Mining Corporation



#### PREPARING TO DECK A BRIDGE

Richmond Offset Hanger Fram-Tys used to support the deck form of a bridge from precast, prestressed concrete girders. Adjustment of the form to proper elevation is accomplished by turning up the Tylags (bolts) into the helical coil of the hanger.

ments to concrete structures, clamps for column forms and lifting inserts for precast and prestressed concrete beams and slabs.

About 13 percent of the items sold are reusable and returnable parts, such as Tylags, Tywashers and Tyholders. Upon return, they are credited to the customer's account and are then reconditioned at the factories.

Although Richmond stocks a large variety of standard sizes and styles, many construction jobs demand special shapes and sizes—the result of the imagination and ingenuity of architects, together with inherent peculiarities of structure location. Hence, there is a limit to standardization; and consequently, Richmond's production department must be ready to retool machines and alter procedures to mass produce new shapes.

Design of new products is handled for the most part by the Technical Department, which also offers other valuable services to architects, engineers and constructors. For the prospective customer, it furnishes full information about Richmond products and their applications. It makes engineering estimates of requirements based on the customer's job, in conjunction with a written bid. It makes full job drawings for the applications of the devices furnished, complete with engineering data. This department also performs a vital function in the company's contribution to the technological and educational advancement of the industry it serves.

Through visual aid slides, technical papers, lectures and demonstrations, Richmond carries on this program not

following general classes: form-tying devices; anchoring systems; hanger systems; and accessories.

Form-tying devices include the many ingenious systems used to hold forms rigidly in place during pouring and setting. Some are simple, wire tensioning strands holding the form elements. Others, where greater holding capacity and adjustment are required, incorporate screw-thread tensioning features. In either case, the section imbedded in the concrete becomes a part of the structure. In the former case, when forms are to be removed, a twist of the protruding tie section snaps the tie member at a preformed break point immediately within the pour—hence the trade name Snap-Ty. In the threaded product, the form removal is accomplished by screwing out the lag-threaded tie bolt from its matching female member, remaining in the structure—hence the name Ty-screw.

Anchoring systems provide permanent or temporary cast-in-place fastening points to concrete structures. Typical applications include fender systems on docks and piers, column-base anchorage

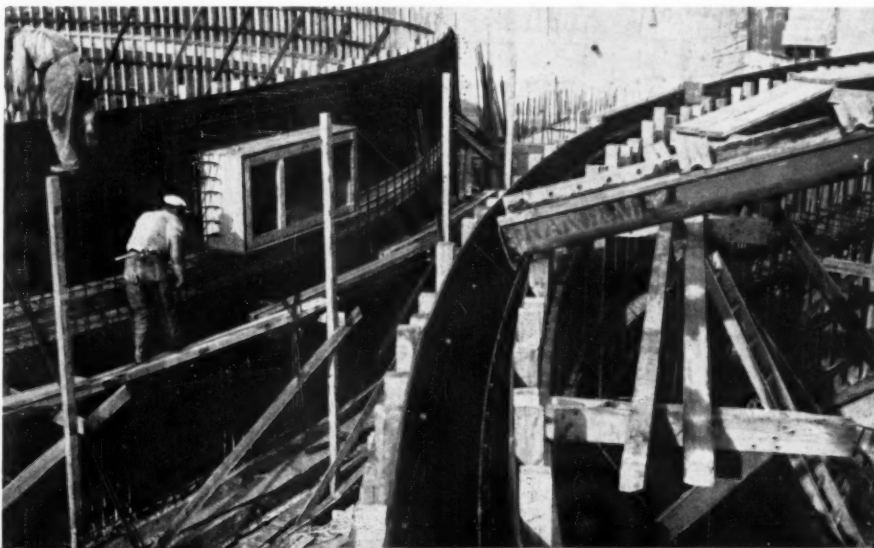
in structural steel construction, seat brackets in concrete stadiums and anchorage of large steel cantilever forms. The system consists of a helical-coil anchor imbedded in the concrete and a matching skein threaded anchor bolt. Other anchors, utilizing the Tyscru coil (tapped for standard machine thread bolts) are used as anchors for guard rails and other purposes.

Hanger systems are designed to support, from structural steel framework, the concrete forms for decks, slabs and other pours incorporating the framework members.

Accessories include such labor-saving products as supports for reinforcing bars, screeds, many types of inserts for attach-

#### TANK MAKING

Circular wall forms for concrete tanks showing how Tyscrus are used with Wood Tycones to spread, as well as tie, the two sides of the form. The inside form is erected first, and Tyscrus and Tycones are attached. Reinforcing steel is then placed, and the closing form is secured. Bracing is only required for alignment of the inside form.



only through trade shows, its dealer organizations and special representatives, but also through The Producers Council (an organization of building products manufacturers), the Association of Collegiate Schools of Architecture and directly through the many architectural and engineering colleges.

As is evident from the accompanying illustrations of a few items from the Richmond line, their fabrication is essentially one of wire-straightening, cutting, bending, forming and welding, with some thread-cutting and thread-rolling as well as punch-press heading and cutting operations. The castings used in a few products are purchased in finished forms as are certain special wrenches and the malleable-iron wedge inserts used where impact or vibration are factors.

The wire used, more than 30 miles each day in the Brooklyn plant, is delivered from a steel supplier in large rolls and is transferred to reels for feeding into production machines that straighten and cut it to prescribed lengths. Sixteen different diameters are used, ranging from 0.162 to 0.5625 inch. For most items, the wire specification is bright basic AISI-C1008, or medium carbon bright basic AISI-C1038. (Galvanized wire for tying devices is carried in stock in a few diameters to meet occasional requests.) Rolled-thread studs are made from  $\frac{7}{16}$ -,  $2\frac{1}{32}$ - and  $\frac{7}{8}$ -inch low-carbon steel, and the anchors, from four sizes of flat bright cold-rolled steel ranging from  $\frac{7}{32} \times \frac{1}{16}$ - to  $\frac{7}{16} \times \frac{1}{8}$ -inch, as well as from several sizes of round wire. Square-head hot-formed bolts are received without threads in six diameters from  $\frac{1}{2}$  to 1  $\frac{1}{2}$  inches inclusive, and are



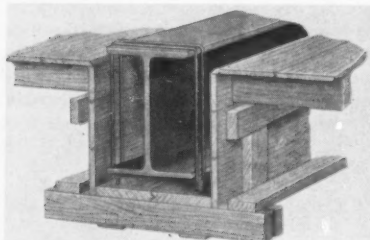
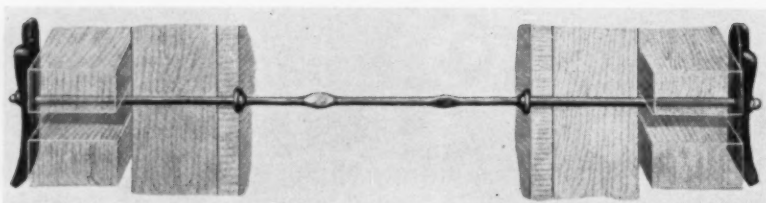
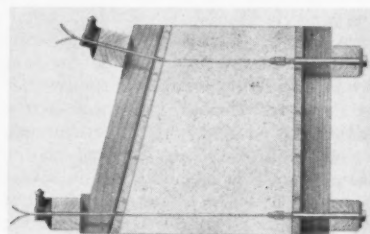
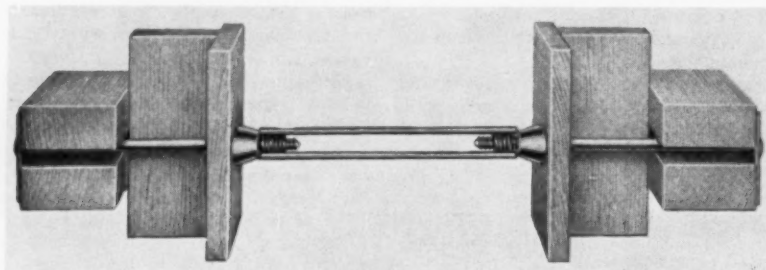
#### HIGH-SPEED WELDING

The Taylor-Winfield press welder, illustrated above, is being used to resistance weld helical-coil thread sections to two or four high-strength steel rods, or struts, to form a Tyscru. This unit was originally mechanically operated, as were the other four at the facility. Today, all but one are air powered. To adapt them to air operation, Richmond engineers added a double-acting A. Schrader's Sons air cylinder to the head support, a Bellows Company double-acting air valve and a Schrader air lubricating-and-regulating system. Air power was selected because production capacity was increased, precision control of the pressure of the welding stroke was possible and a functional diversification was permitted.

threaded with special threads at the plants.

Quality control is of paramount importance in the manufacture of the Richmond line. Many of the products are critical to safety, not only with respect to construction workmen, but to the

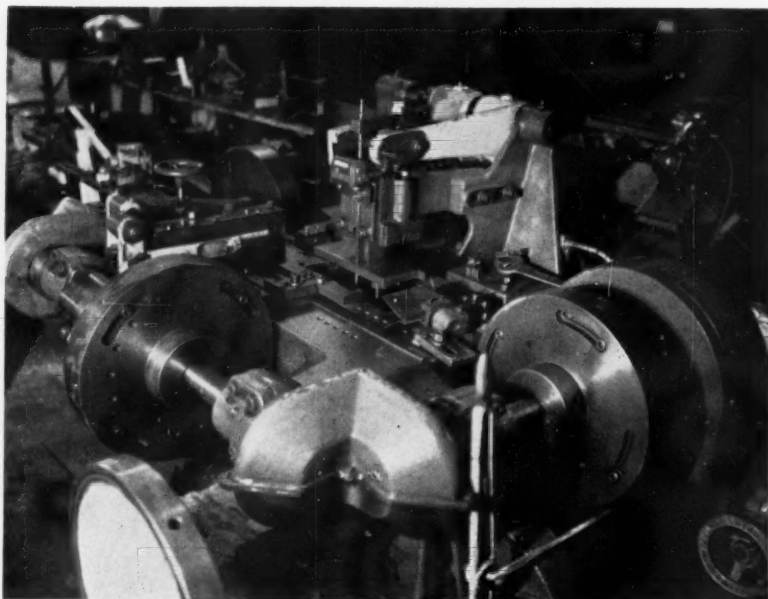
completed structure. Proper strength characteristics are, of course, particularly important with respect to form tying and hanging, where the gravest danger would exist if loading limits of the forms were not adequately covered. Until the initial set takes place within a form, the



#### SOME OF THE LINE

Serving a wide variety of uses in the concrete-construction field are these four Richmond products. At the top, left, is a Tyscru, and below it is a Snap-Ty. At the right, top and bottom, are drawings of a Flex-Ty and Ty-Hanger,

respectively. In all, the line contains some 200 standard items. However, because of the complexity of the building field, hundreds of variations are manufactured daily to meet contractors' and architects' specifications.



#### MULTIPLE BENDERS

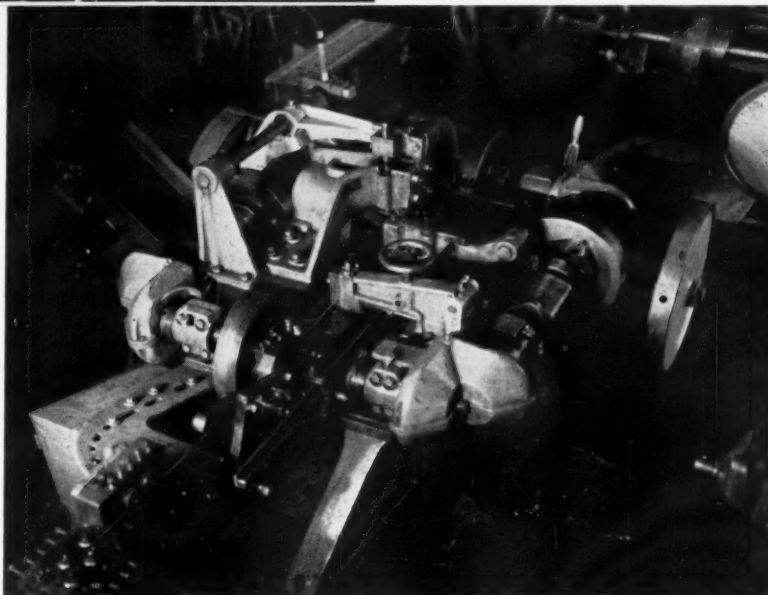
In excess of 90 percent of the approximately 200 bent-wire shapes needed in the Richmond line are made on A. H. Nilson Machine Company, 4-slide machines of the type illustrated in these two photographs. A feeding mechanism pulls the wire through a series of straightening rollers, it is then cut off to the proper length and wrapped around a central core or center die by the four die-equipped slide blocks. Compressed air then ejects the finished part. These units are both high-speed and automatic, the rate of production depending on the size of the wire and the complexity of the shape. They are driven through Reeves Pulley Company Vari-Speed Motordrives. Although they are capable of producing a wide variety of shapes, either by changing the center core and dies or the motion, they form the parts to close tolerances.

concrete exerts a liquid pressure against the form members. Because most concrete weighs approximately 150 pounds per cubic foot and may stand at a considerable height in the form, extreme pressures may develop, especially at the base of the form. Spot samples of the form-tying devices are taken from each lot during production for tensile strength testing, thereby assuring that there will be no form collapse attributable to the ties. Additional testing is performed on products following any change in machine tooling or setting.

The pressure of competition dictates manufacturing at the lowest possible unit cost, while at the same time, maintaining a high quality standard. This is achieved through wise management, efficient working forces and considerable automation. Because the field is relatively small as compared to major divisions of American industry, the manufacturers of equipment adaptable to many of the unique operations could not afford to develop automatic equipment exclusively for these applications. Thus, it has been necessary for Richmond engineers to provide cost-cutting equipment, and this they have done by designing and building machines or by adapting existing equipment to fulfill their requirements.

Through this necessity, the production department knows the value of compressed air as a means of shaving costs. Pneumatic and electronic controls and actuation are replacing mechanical action where time-and-motion studies have indicated the conversion justifiable. In the Richmond facilities, the advantages of pneumatic over mechanical actuation at many points are summarized by management as follows:

•Productivity is increased through



speedier and easier operation, the reduction in machine down time and improved operator morale.

•Maintenance cost is about halved.

•Some equipment designed to perform but one operation can, by means of pneumatic accessories, be adapted to multipurpose work.

•A limited-intake-capacity machine can be transformed to one with a broad-capacity range by conversion from mechanical to pneumatic operation utilizing the "infinite" ram pressures of an air cylinder.

•Richmond has found the use of air-actuated resistance welding presses helpful in maintaining uniform weld procedures at required high production rates.

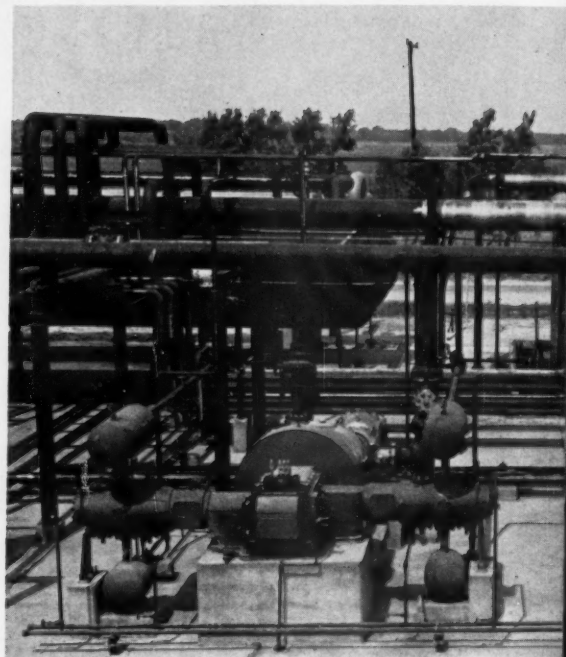
•The operational dirt and attendant hazards and inconveniences from oil, grease, gears, belts and pulleys of mechanical drives are largely eliminated.

The building materials industry has become a vast complex of prime manufacturers, converters, fabricators, sales and distribution organizations. The forecast calls for it to become even more complex as science and industry make concrete an ever-more useful servant of man. The widespread acceptance of precast and prestressed concrete units and the growing application of lightweight aggregates to concrete are among recent developments that are accelerating the use of concrete in construction. Richmond Screw Anchor Company, Inc., is a part of this concrete revolution.

# Recovering "Wasted" Horsepower

H. F. Smith

For many years, all natural gasoline extraction plants throughout the gas-producing areas of the Southwest have wasted valuable horsepower. La Gloria Oil & Gas Company, Corpus Christi, Tex., has made great strides in an effort to harness this energy.



**B**EFORE the days of the cross-country pipelines, natural gas was not considered a valuable resource. Many natural gasoline extraction plants were built, but the fuel required to generate horsepower was thought to be "free." These plants, as originally built, extracted available hydrocarbons from raw gas, then sold the stripped gas to any local market. If no market existed, the gas was flared. In 1946, the Oil Conservation Agency (Texas) put a no-flare order on the larger fields of the State; plant operators had only the alternatives of selling the gas to pipelines, or injecting it back into the ground. About this time, the price of gas started

rising and with each increase, fuel to operate the extraction plants became more important—no longer could it be considered "free." Today, operators look primarily to efficient machinery to reduce the cost of the required fuel.

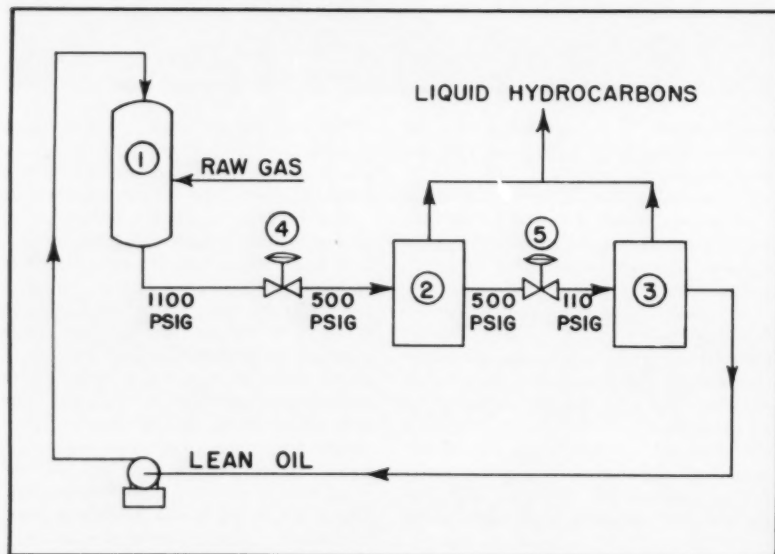
A natural gasoline extraction plant's raw feed is natural gas, either from gas wells or from separators at oil wells where both petroleum and gas are produced. Two processes are used to extract the fractions of the gas that can be liquefied: one is an absorption process, and the other, a refrigeration technique. The former is the most commonly accepted method.

The absorption process requires the

circulation of a considerable volume of an absorbent which is usually a light oil similar to diesel fuel. The absorption oil is pumped through towers called absorbers, counterflowing a gas stream. The oil becomes saturated with hydrocarbon fractions that can be distilled from the oil and then liquefied. The saturated absorption oil is called "rich oil."

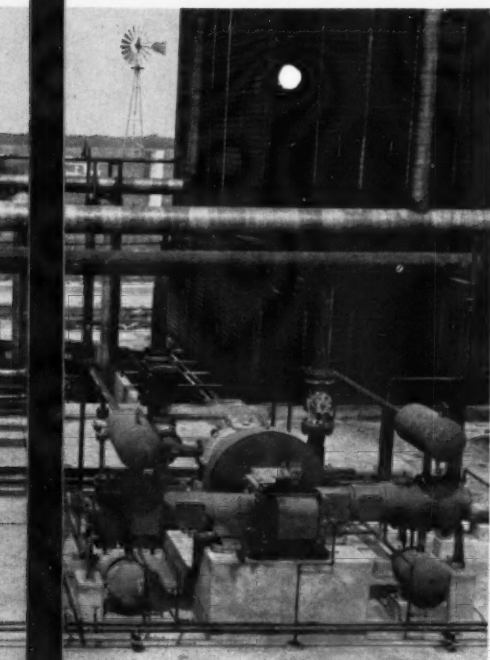
The absorbers usually require an internal pressure of several hundred pounds per square inch; the distilling process, on the other hand, is usually carried on at less than 100 psig. Thus, the rich oil must be reduced in pressure when taken from the absorber to the still. Commonly, this is done by bleeding it through a diaphragm motor valve. La Gloria has experimented with a number of small, positive-displacement turbines that utilize high-pressure rich oil as the power medium to drive small centrifugal pumps.

Recently, H. C. Givens, Superintendent



## ABSORBENT CYCLE

Lean oil is pumped into the absorber (1), there picking up liquid hydrocarbons from the raw-gas in-feed. Pressure in this section is 1100 psig. Next it flows through a reducing valve (4) to lower its pressure to 500 psig. This reducing valve is one that La Gloria has replaced with a 6-inch, 3-stage Rich Oil turbine. The oil flows then into the high-pressure still (2) where a portion of the liquid hydrocarbons is stripped. As it emerges, its pressure is reduced to 110 psig by passing it through another valve (5). (At La Gloria, this is replaced by a 4-inch, 2-stage Rich Oil turbine.) The remainder of the liquid hydrocarbons in the absorbent is then stripped in the low-pressure still (3).



### COMPRESSORS

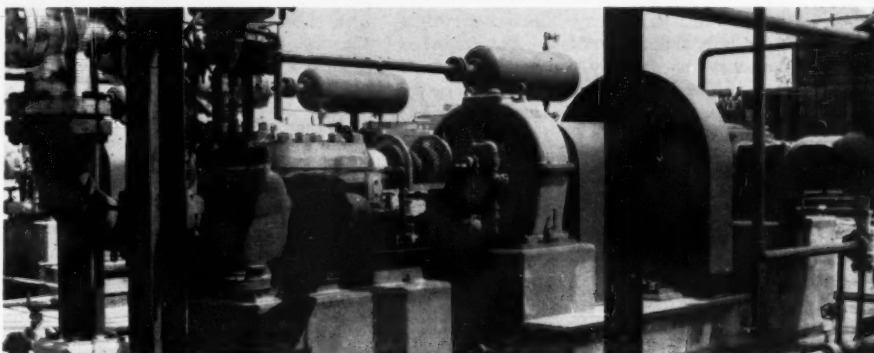
Shown above are two of the three Ingersoll-Rand HHE compressors at La Gloria Oil & Gas Company's Falfurrias Plant that are being driven with once-wasted horsepower. At the left is one of the 625-psig-pressure machines; the other is rated at 1144 psig. The compressors handle natural gas at an inlet pressure of 14.4 psia.

ent of La Gloria's Falfurrias (Texas) plant, made a study of the available supply of rich oil and found that there was a total of 4100 gpm available at a pressure of 1100 psig. All of this was normally flashed to 500- to 600-psig pressure through a reducing valve. Thus was born an idea whereby approximately 1000 hp could be "recovered" by converting this reduction in pressure, or potential energy, into usable power.

Three Ingersoll-Rand horizontally split, 3-stage Rich-Oil turbines were installed, each driving an I-R Type HHE compressor. Approximately 350 hp per machine has thus become available—energy that otherwise was wasted. The service conditions of the turbines are:

Turbine Number	No. 1	No. 2	No. 3
Inlet, psig	1100	975	1125
Discharge, psig	620	500	500
G. P. M.	1500	1300	1300

The compressors handle natural gas from the absorption tank, and return it to the well for reuse in the absorption process. They have a uniform intake pressure of 290 psig and operate at 500 rpm. Each is driven through a Lufkin M-168A reduction gear. Two of the machines discharge at 625 psig and the third, at 1145-psig pressure. The two 625-psig machines have two 6-inch di-



### TURBINES

This pair of illustrations shows two of the 6-inch, 3-stage Rich Oil turbines that utilize the energy in saturated light oil or absorbent that must be reduced in pressure before the fractions picked up from natural gas can be distilled from it. The oil enters the turbines at 1100-psig pressure and emerges at 500- to 620-psig, giving up about 350 hp in each of the units. Formerly, the rich oil was flashed to the lower pressure through a valve. The turbines operate at 3350 rpm, driving the 500-rpm compressors through a Lufkin reduction gear. The 6-inch turbines utilize a total of 4100 gpm to drive the HHE's. Other Ingersoll-Rand 4-inch, 2-stage Rich Oil turbines use an additional 1000 gpm at 500-psig and seven other small turbines of lesser horsepower ratings are also used.

ameter cylinders of 9-inch stroke and piston displacements of 282 cfm. Each has the capacity to handle 7,000,000 cubic feet per day of gas at 14.4 psia and inlet temperature. The 9-inch-stroke, 1145-psig compressor has one 6-inch low-pressure and one 4¾-inch high-pressure cylinder, a similar piston displacement of 282 cfm and a capacity of 3,800,000 cubic feet per day at similar inlet conditions.

In addition to this application, there are two Ingersoll-Rand horizontally split, 2-stage Rich-Oil turbines utilizing 1000 gpm at 500 psig and discharging at 110-psig pressure. These drive positive-displacement vacuum pumps and develop 150 hp each. In the plant there

are also seven other drivers of smaller horsepower ratings doing various jobs in the process.

Cost-conscious engineers haven't confined themselves only to the energy savings to be found in the rich oil streams: 3000 hp is obtained by expanding 7-psig exhaust steam to vacuum. This steam comes from the exhaust of a number of small, high-pressure turbines. Another 500 hp is recovered by expanding fuel gas from 300-psig to 50-psig pressure through ordinary steam turbines. Still another recovery is affected by expanding 1000-psig pressure residue gas through a vertical reciprocating steam engine to 700 psig, and thence into a cross-country pipeline.

# The New Aeroscope

Peter Sleight

**D**URING its 62 years of publication, COMPRESSED AIR MAGAZINE has reported a number of unique uses of compressed air. Recently, information about an air-operated camera was found, and it may well prove to be one of the more unusual. This pneumatic device, called the Aeroscope, was in popular use during the first 3 decades of the twentieth century. Since then, it has not only fallen into disuse, but has been almost obscured by the ever increasing tide of technical improvements. Nevertheless, the invention represents advances both in the field of pneumatics and in the history of cinematography.

The original patent for the Aeroscope was issued in Belgium in 1906 to Kazimierz Proszynski, a Polish inventor born in 1875. At the time, he was an engineering student at Liege Polytechnique, Belgium. In 3 years, a French adaptation was patented, and in 1910, the "new Aeroscope" was registered in England where the major amount of research on the device had taken place. In describing the camera, the last patent states that it had "for its object a practical and complete solution of the problem which until now has been considered as being impossible to carry out," reference being made to the camera's ease in handling, even in view of its self-contained power supply.

The story of Proszynski and his invention was revived recently through the efforts of The British Kinematograph Society and its publication, *British Kinematography*. That journal contained an article researched and written by Bernard and Elizabeth Orna. The essay was aptly subtitled, "A Forgotten Pioneer," and detailed many of Proszynski's inventions in the motion-picture field.

Proszynski, even as a student, had several patents to his credit, and was beginning to apply the principles of cinematography to education. This was not unusual, for his grandfather had managed a photograph shop in Poland for a number of years, and his father was the famous educational writer. The son had long searched for a device whereby edu-

cational, documentary or topical films could be shown for classroom work.

The basis of his research apparently was lodged in solving two shortcomings of conventional cameras in use prior to the development of the Aeroscope. One was the defects in the mechanism for pulling the film through the film gates of the cameras, and the other was involved with screen flicker during projection. The inventor tackled each of these problems in turn.

The Pleograf, his first camera apparatus, was over-complicated and relatively no information is available about it today. However, it is known that the device utilized a perforated celluloid film. Teeth on an eccentric engaged these holes, thereby pulling the film past the film gate. This mechanism was patented in France, was later elaborated and eventually became an integral part of the Aeroscope.

To overcome flicker, Proszynski invented a projector called a Bio-pleograf in 1898. It required two lenses and two

positive films, each made from the same negative. These attempted to eliminate the screen problem by synchronization, thereby considerably reducing the intervals between frames on the film.

Although an improvement, Proszynski was not satisfied. In collaboration with a precision mechanic in Warsaw by the name of Marian Sitkiewicz, a new Pleograf was developed that utilized one lens and a single film. The only portion of the original Pleograf to be developed for and improved in the new model, and that which later became an incorporated part of the Aeroscope, was the 2-claw engaging mechanism.

Additional efforts to eliminate flicker resulted in the development of a 3-wing shutter. Knowing that a "persistence of vision" was necessary for viewing a motion picture, a theory had been established stating that the brain retains images for 1/7 second. Proszynski was familiar with this, but expanded it to include the fact that the brain also registers interruptions of light. He estimated

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## The British Kinematograph Society

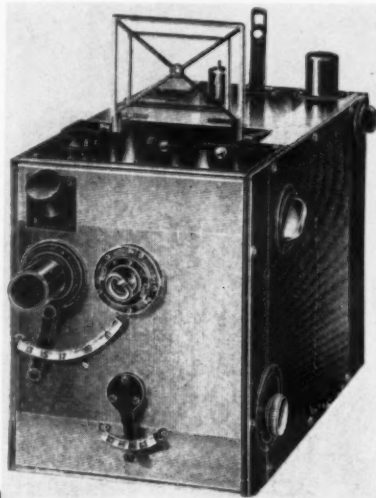
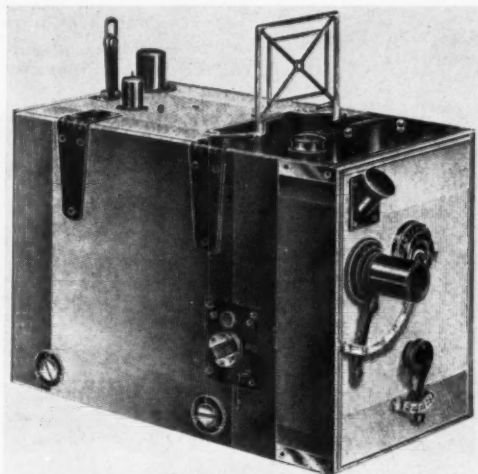
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**F**OUNDED in 1931, The British Kinematograph Society, for a number of years, restricted its membership to engineers. However, in the early 1940's, it began to expand its endeavors; and today, there are five categories of membership: Fellowship, Corporate, Associate, Affiliated and Student. These encompass all those individuals who are active in promoting, either through their work or their interests, the industry.

The Society is divided into four sections, the names of which indicate the type of work that is done in each. These include the Film Production Division, the Theater Division, the 16-mm Film Division and the Television Division. Each operates independently for programming its events, but often calls upon another for assistance. During the

meetings, papers are read and problems discussed, in that way furthering the knowledge of cinematography. Many of these studies are not only original in content, but represent a considerable amount of research.

Representatives of the Society are located throughout the world, and the group keeps a close liaison with similar societies in the United States. Thus, there is an exchange of information on technical matters to improve the industry in general. An advisory service, library facilities and a dissemination of technical information on developments complete the work. In brief, the Society's aim is the "encouragement of scientific and technical progress in cinematography and its allied arts and sciences."



#### AN ADVANCE IN CINEMATOGRAPHY

These line drawings first appeared in an industrial bulletin published by Eracam Limited for Peeling & Van Neck, Ltd. It is now on file in the library of Eastman Kodak Company, and the mechanism itself is located at the Science Museum, South Kensington. On the side of the illustration at the right can be seen, near the front, the operating dial for regulating the air flow to the motor. Beneath it is the

starter; and to the rear, the safety lock to the air valve. The front shows engraved arcs for focusing and speed levers that could be positioned while the camera was in operation. The visible side, in the view at the left, contains the film magazines. The mechanical connection shown near the front of the box is for attaching a hand crank, should this be necessary.

that an interval smaller than  $1/40$  to  $1/50$  second would be beyond an observer's perception. With these two principles in mind, he devised a shutter with three wings of exactly the same dimensions and spaced at the same intervals. When they rotated at 15 rps, there were, in actuality, 45 alterations of light and dark per second—enough changes to substantially overcome flicker. The 3-wing shutter was demonstrated in Paris before representatives of two of the pioneer companies in topical and newsreel films—Gaumont and Pathe. The former realized its value and adapted it to its cameras.

At the same time, work was going on in London on the Autopleograf, the prototype model of the Aeroscope. As described in a specification sheet published by the distributor, Eracam Limited, London (the manufacturer being Peeling & Van Neck, Ltd.), the Aeroscope's case was  $12\frac{1}{2} \times 8\frac{3}{4} \times 6\frac{1}{2}$  inches in size, made of the "finest old mahogany, edges brass bound."

One side of the unit was devoted to space for circular sheet-steel magazines. Up to 400 feet of film could be loaded at a time, more than was possible with any camera of that period. The opposite side contained a motor mechanism and four compressed air cylinders. Its total weight, when fully loaded, was but 14 pounds. Thus, it was easily handled under difficult circumstances.

Air at a pressure of 400 to 500 psig

was contained in the cylinders. They were drawn into tubular shape and were without joints. According to sales literature, they were capable of withstanding a 1500-psig pressure. The cylinders were loaded either by a triple-expansion hand pump or, as was later used by Movietone, compressed air cylinders mounted on a van. One charging was enough to keep the camera in operation while the entire 400 feet of film was used.

Air was transmitted from the cylinders to a single-cylinder beam engine through a small decompression chamber, the operating pressure being reduced to 40 psig. A valve, located on the chamber and easily accessible from the outside of the mahogany box, started and stopped the mechanism by regulating the air pressure.

Rotary movement from the motor's piston drove a small oscillating beam, thus turning a shaft. To this was attached the claw mechanism for pulling the film through the gate. A flywheel provided momentum for continuity of action, one of the more serious faults with former hand-cranked cameras.

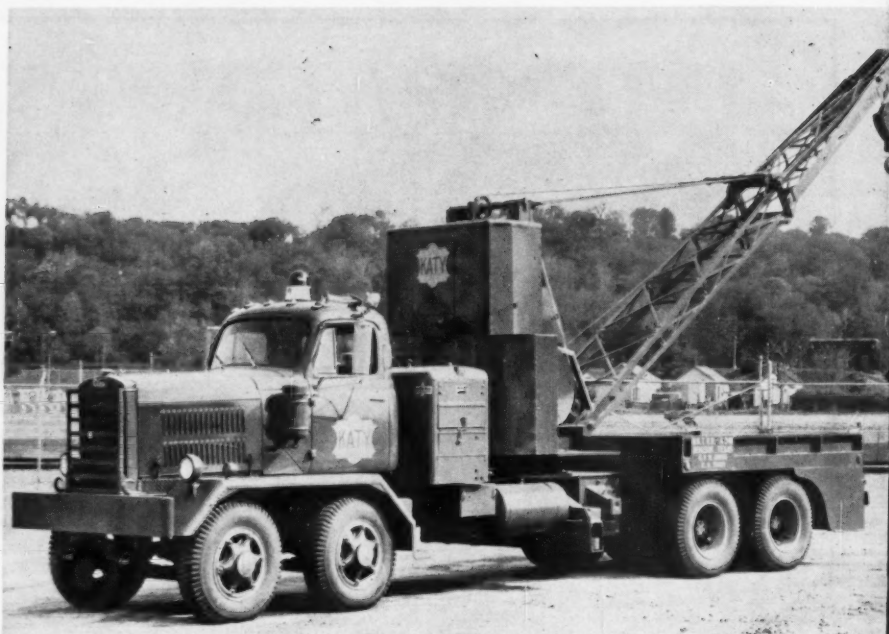
The Aeroscope, manufactured commercially only in England by Newman & Sinclair (marketed by Cherry Kearton, Ltd.) and later by the Van Neck firm, enjoyed great popularity in the field of documentary pictures filmed in the more remote spots of the world. Cherry Kearton himself, a British pioneer in photographing animal life in mid-

western America and Africa, used it from 1912 to 1918, as did Paul J. Rainey, an American big-game hunter. Geoffrey Malins, of the Gaumont firm, took the camera for newsreel work. While he was a reporter for the British War Office, he praised the lightweight machine for its service on the front during the Belgian Campaign of 1915. Without the development, many of the more prized documentary films of state occasions—two of the more notable being the Coronation of George V and the funeral of Queen Alexandra—would be unknown today. Racing meets, sporting games and boxing matches also proved a rich source for the Aeroscope.

Proszynski continued his developmental work on the camera and tried his hand at other cinematographic devices for a number of years, many utilizing compressed air. An example of his work was a pneumatic coupling and air-operated apparatus to synchronize a Kinetograph and a Phonograph (British Patent No. 22,415,1908), thus giving the world one of its first "talkies."

The inventor returned to Warsaw to continue his work, trying as he had always done, to make Poland one of the leading cinematographic countries of the world. Economic conditions in that country prevented this, although his work continued. In 1944, Proszynski was arrested by the Nazis, and he died a year later at the age of 70 in Maltahausen concentration camp.

# AIR POWER REDUCES RAILROAD REPAIR TIME



## CLINE RAILROAD WRECKING TRUCK

This versatile vehicle is useful for handling rail car problems, short of major derailments. Behind the cab can be seen the Ingersoll-Rand 125-cfm-capacity Gyro-Flo rotary air compressor that supplies air to a pair of 100-ton-capacity air jacks. The crane has a 25-foot hinged boom and can move a load of 15-tons. The rig can readily answer any distress call.

**A** RAIL CAR that becomes derailed or develops a hot box has always presented railway maintenance personnel with costly, time-consuming and irksome problems. In the first case, there is delay in train movement while the car is replaced on the tracks, checked for damage and repaired if necessary.

The car that develops a hot box also holds up traffic until the defective car is uncoupled. Then, the car must be removed to a siding where labor and time go into replacement of the bearings that have developed trouble. No matter which is the

case, the rail car is not seeing profitable service.

Two special vehicles, one called a "Railroad Wrecking Truck" and the other a "Wheel Change Truck," are built by Cline Truck Company of Kansas City, Mo., to solve such railroad problems. Rail cars are difficult to handle because of their great weight, their cumbersome bulk and the fact they often break down in locations remote from servicing facilities or in generally inaccessible areas. The Cline trucks are designed to overcome these difficulties and are recommended for any railroad mishap, short of major derailments or wrecks, for which a complete wrecker train and "big hook" crane are, of course, required.

The Cline Wrecker consists of a sturdy gasoline or diesel engine truck, behind which is mounted a 15-ton cable crane. An Ingersoll-Rand 125-cfm-capacity Gyro-Flo rotary compressor is installed



## READY FOR WORK

A Cline Wheel Change truck has been pulled next to a railway siding from an adjacent road to await the delivery of a disabled car to the site. Use of the truck allows a set of wheels to be replaced in about 2½ hours while old methods required from 6 to 7 hours and made use of a rail flatcar. The radio antenna atop the truck cab allows communication with maintenance headquarters.

directly behind the truck cab. It gives the vehicle its unique feature by providing air, through 100-foot lines, to two, hefty, 100-ton air jacks.

The 15-ton crane is used chiefly for the movement of empty cars following derailments. It rights the cars that have been overturned and realigns them on the rails. Empty cars, that have developed hot boxes, are lifted by the crane. Then, new wheels are installed, and the car is returned to its proper running position.

On loaded cars, the crane is teamed with air-powered jacks for replacing wheels. To do this job, the jacks are positioned under the end of the car where the hot box is located. The Gyro-Flo is started, a valve is thrown and the jacks raise the car several inches above the defective running gear. The crane comes into service for removing the old wheels and for placing the new ones on the track. When the new wheels are moved into position, the air valve is actuated again, and the car is lowered upon them. This completes the major part of getting the car back into use. The Cline Wrecker then carries the defective running gear to shops for repair.

The company's Wheel Change Truck is similar in design to the larger Wrecker, but carries a 6000-pound-capacity hydraulic crane instead of the longer heavy-duty cable-type, on the Wrecker. The Wheel Changer is utilized, as its name implies, mainly for replacement of rail wheels, and also mounts a 125-cfm Ingersoll-Rand compressor to provide air for pneumatic jacks.

The process of replacing wheels on a loaded car, using the Cline vehicles, takes approximately 2½ hours and demands little muscle power from the men doing the work. At one time, this job consumed about 6 or 7 hours and was very hard work. Formerly, a flatcar carried the spare wheels and necessary tools to the siding where the hot box was located. Hand-operated jacks were used to raise the defective car, taking from 1½ to 2 hours. (The air jacks carried by the Cline trucks do it in about 4 minutes.) With the car thus laboriously jacked up, the defective wheels were moved away manually, and new ones rolled down a portable ramp from the flatcar. The old ones were then rolled up the ramp.

A general car foreman for a mid-western railroad has described this last operation as a herculean task which sent many a man to the hospital. He said that the trucks are the most useful advance in his work during the 27 years he has been with the railroad. Using a Wheel Changer vehicle, his men installed 27 pairs of railroad wheels in 1 month's time; he doubted that one-fourth this number could have been replaced in a like period by using the former flatcar method.

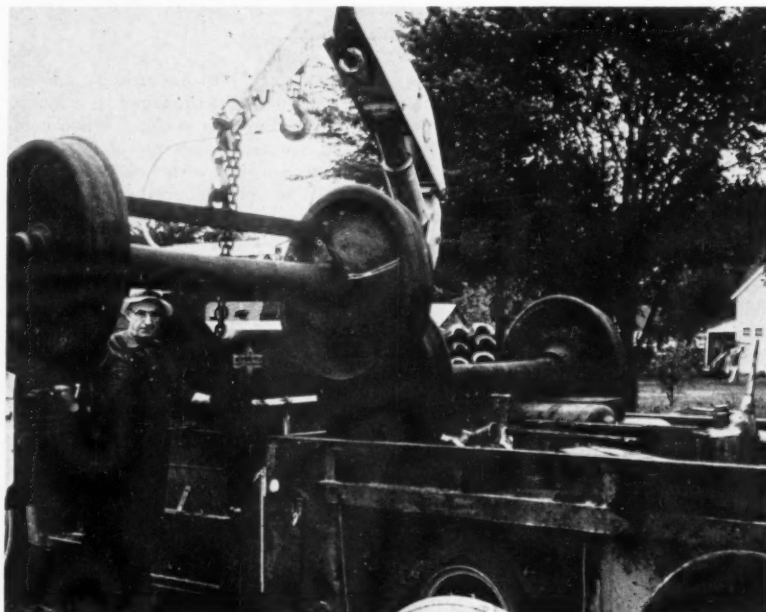


#### AIR JACK IN OPERATION

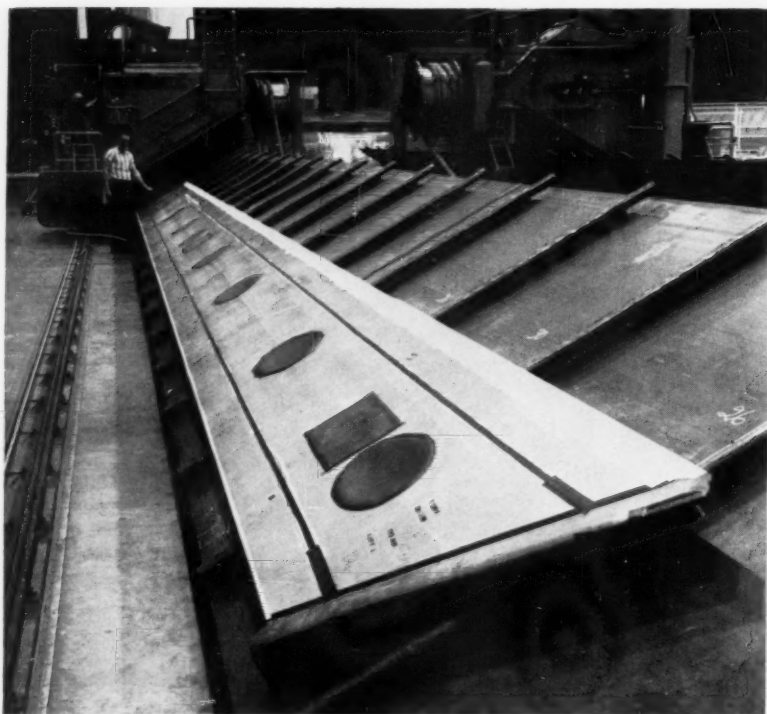
The air jack in the foreground is the type carried by the Cline vehicles for hoisting rail cars during replacement of wheels that have developed hot boxes. The jack has a 100-ton capacity and is powered by air from an Ingersoll-Rand compressor mounted behind the truck's cab.

#### RAIL WHEELS UNLOADED

A pair of railroad wheels is unloaded from a Cline Wheel Changer via the 6000-pound-capacity hydraulic crane. While the two 100-ton air jacks hold up a rail car, the crane removes the defective wheels and replaces them with a new set.



## This and That



### PEENAMATIC

Boeing Airplane Company uses shot peening equipment at its Wichita, Kan., facilities for both stress relieving and contouring parts for B-52 global bombers. Shown in the illustration above, an integrally stiffened skin panel is being shot peened with a Peenamatic, a product of Metal Improvement Equipment Company. It has a work table track 96 feet long and can handle material as large as 76x6 feet. The process is reportedly simpler, faster and less expensive than rolling, die forming or heat-treating. The unit fires steel shot at the work by compressed air from ten nozzles mounted on a moving carriage. Force of the shot changes surface contours and hardens the material. In normal operation, the Peenamatic operates at a pressure of about 25 psig, although more than twice this pressure is available. It is reported that the finished surface is so smooth when the operation is ended that it can be finish-machined without further milling.

**Lighthouse Built Like Telescope**  
Anchored midway between the Swedish mainland and the Oland Islands, a lightship has been riding at anchor for a number of years. It is soon to be replaced, however, by a unique lighthouse. Built by the Royal Swedish Board of Shipping & Navigation, it has features that make it economically possible to build in underwater areas heretofore thought impossible. Having been towed some 100 miles from Islinge Harbour in Lidingo Island, near Stockholm, the 1650-ton building has a diameter of 60 feet and the shell-like caisson, a height of 56 feet. Submerged at the construction site, some 1000 tons of water were pumped into its outside sections. When the caisson became firmly set at its new location, another 1000 tons of water was pumped into its center. Because of the water pressure, an inner caisson raised, telescope fashion, 24 feet. It was then

joined to the bottom unit by casting and is to be used as the foundation for the remaining building stages. When completed, the beacon will rise 115 feet above sea level, crowned with a helicopter platform. The inner caisson, at the time of launching, was pre-equipped and in full working order for its varied purposes, including four floors for machinery and living quarters.

### No Coal On Unique Conveyor

Johnstown Coal & Coke Company is utilizing a Hewitt-Robins conveyor to carry miners into, and out of, one of its shafts. Called a Manveyor, it is 450 feet long, 25 inches wide and extends from the mine entrance down a 20-degree slope—a 97-foot elevation change. The men sit or lie down, facing forward, and are moved along at a speed of 150 feet per

minute. The entire trip takes but 3 minutes, and during a shift change, the belt deposits one miner every 6 seconds. It was installed at the Panther Gulch, W.Va., mine because it was more economical than the usual mine elevators.

★ ★ ★

### Algae Into Space

Tests with the cultivation of microscopic chlorella algae under conditions similar to those that might exist at proposed space stations on the nearer planets are being carried out at the Stockholm University of Technology. The algae may supply both oxygen and food to space colonizers. In this attempt to apply technical microbiology to astronautics, the guiding principle would be to pump the algae solution in a closed, transparent tubing system around the space station together with the station's own volume of air. When growing, the algae need light, carbon dioxide and nutritive sales; and in this process, they produce oxygen. The carbon dioxide would be supplied by the space inhabitants when exhaling; they, in turn, receiving fresh supplies of oxygen from the algae. In order to obtain a raw material for food production, the thin suspension of algae is centrifuged into a tasteless green concentrate that smells like grass and is rich in both proteins and vitamins. It can be used for processing various types of food.

★ ★ ★

### Another Use For Old Sol

Investigation of the direct generation of electricity from heat is currently exciting the minds of researchers the world over. The process involves the use of a power plant known as a thermoelectric generator. Unlike today's conventional steam generating plants that are large and complex, the thermoelectric generator is small, compact and has no moving parts. Its operation is based on the principle that when certain materials are joined together, then subjected to external heat, d-c current is generated. The idea is not new, but former progress has been limited by the low efficiencies of available materials. Recent advances in solid state physics have provided new materials and a better understanding of the design and construction of thermoelectric generators. This has renewed the interest of engineers at Horizons, Inc., Cleveland, Ohio, who are investigating possible heat sources. At present, heat from nuclear fission and the rays of the sun command the most thinking, although heat generated by as simple a material as kerosene has been

experimented with. The sun, of course, would provide the best source for it is relatively an unlimited source of energy and is by far the least expensive. As for nuclear fission, complications lie primarily in the existing temperature limitations of materials.

★ ★ ★

#### Sound Frees Oil

High-frequency sound is being pitched at the Athabasca tar sands in an attempt to jar out their store of crude oil. The equipment, in its design phase now, will probably look like a huge radio set with detachable speakers buried in the sand. It is anticipated that the high-frequency waves from the speakers will cause gas bubbles to build up around each grain of sand. Because the bubbles burst with a pressure several times the force of gravity, the oil and sand should be separated in seconds.

★ ★ ★

#### Frogman Dives For Ph.D.

More than 500 dives into turbulent water have been made by Lennart Arnborg, a Swedish scientist. Three years ago, he was commissioned to investigate possible damage to salmon fishing grounds caused by water regulation projects. Since echosounding and raking of river bed tests proved to be insufficient, he decided that the best way to get to the bottom of the problem was to make on-the-spot investigations. Since then, he and his co-workers have perfected the technique

until now they are able to make dives in water flowing as fast as 8 knots, or about 9 mph. During the more than 2000 hours spent underwater, Arnborg has not only directly investigated the fluvial sand, but has obtained some interesting 3-dimensional color photographs. His findings will be the basis of his doctoral thesis, which will deal with "forms of erosion and fluvial processes in the lower Angerman River," and will form the bulk of information on river bed erosion and accumulation for assessing claims for damage caused by waterway regulations.

★ ★ ★

#### Final Lap Across Canada

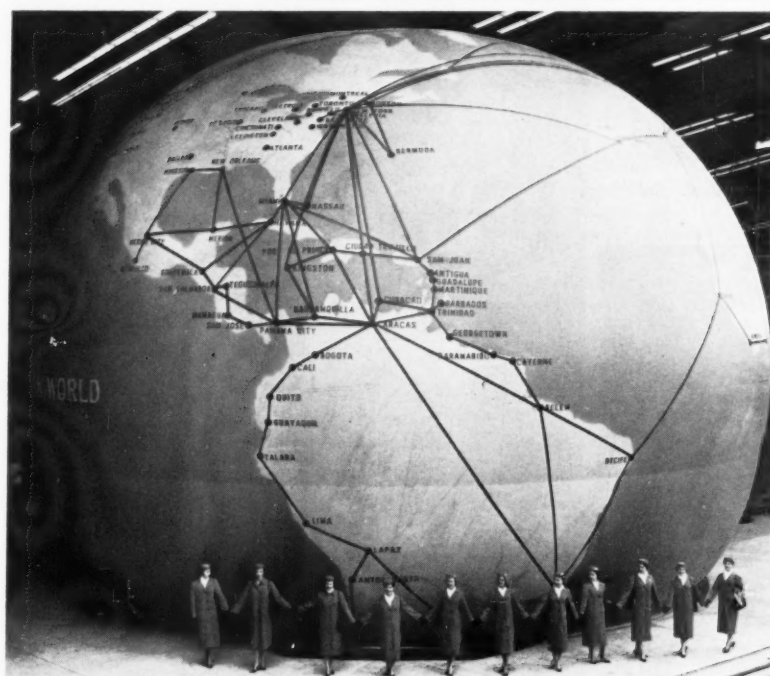
The final link of the Trans-Canada Pipe Lines project will be completed this fall, it is estimated, heralding the start of transmission of Alberta's natural gas to Canadian homes and industries as far east as Montreal, Que. With more than 1300 miles of completed pipeline, twelve construction spreads are working on the last link (Port Arthur to Toronto, Ont.) to finish the world's longest natural gas line. Their task is to lay 853 miles of 30-inch pipe from the Lakehead to Maple, near Toronto, and to connect this central section of the line to the already-completed eastern and western sections. When they are finished, the Trans-Canada pipeline will stretch for 2300 miles, from Alberta, across the Prairies to the Lakehead, sweeping in a wide arc through northern Ontario and on through to Toronto, and from there to

Montreal. There will be nine river crossings in the final section. Approximately 4500 men are working in the field this year during the construction season and the cost for the section amounts to some \$165 million. Besides the actual pipeline construction, six compressor stations will be built this year, five by Trans-Canada and one by the Crown Corporation, with a total of 48,500 hp.

★ ★ ★

#### Nuclear Engineering Home Study

Correspondence schools have become an accepted part of our everyday life. Courses are available in almost every field. For example, now a technical school in Washington, D. C., is offering a home-study course in nuclear engineering technology. It will be made available this fall by CREI Atomics, Inc., a recently formed subsidiary of Capitol Radio Engineering Institute. (CREI pioneered extension courses in advanced electronics for civilian and military personnel 30 years ago.) The curriculum has been under development with the aid of nuclear experts for the past year. Its objective is to provide advanced education in the field in an effort to fill the predicted needs for technicians and other engineering personnel. The lessons are being specifically prepared for engineering and technical personnel in industry, government and military service, who plan to go into fields of both atomic energy and its related applications as knowledge of nuclear energy continues its rapid development.



## BIGGEST EARTH ON EARTH

This 52-foot-diameter map is said to be the world's largest. It shows six continents and 143 cities. The globe is air supported, and is so constructed as to allow 160 persons to sit inside to witness demonstrations of astral effects, including moving clouds, a star-filled sky and twilight. The show requires 5 minutes and is followed by a simulated flight of a U. S. satellite crossing a night sky. The world was manufactured by Irvin Air Chute Company for Pan American World Airways, Inc., of blue, vinyl-coated 18-ounce nylon fabric. A battery of blowers furnish air to support the structure. The pressure needed is but 0.5 psig, and the capacity of the balloon is 100,000 cubic feet. Deflated, the world weighs 700 pounds and can be folded into a 8x6x6-foot package. The astral effects were worked out with the cooperation of the Hayden Planetarium and Spitz Laboratories. When the Brussels Fair closes, where the unique structure has been on display, it will be taken to the United States and sent on tour.

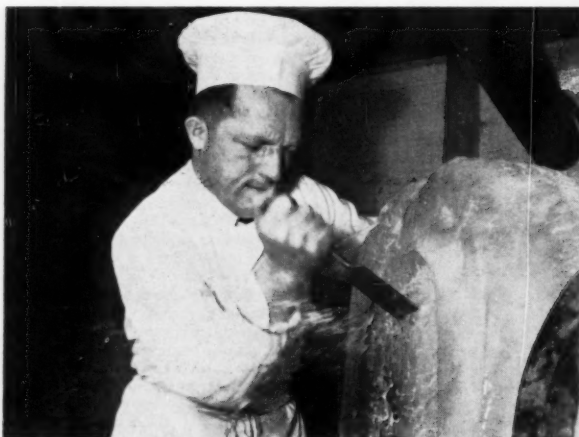
PHOTO, PAN AMERICAN WORLD AIRWAYS SYSTEM



PHOTOS, CANADIAN NATIONAL RAILWAYS

## A CHEF WHO WORKS WITH ICE CAKES

WHEN the management of the Chateau Laurier in Ottawa, Canada, wants a decorative centerpiece for a banquet table, Chef Godfried "Fred" Beetz turns out in a pair of rubber boots. Armed with a set of wood chisels, Beetz tackles a cake of ice weighing, usually, between 300 and 400 pounds. Because the ice must be of proper firmness, it is necessary for him to work in a refrigerated room. There's more to it than meets the eye, because if the ice is too cold, it is excessively brittle. Stress lines may then appear in the work and cracks will follow. The chef learned ice sculpture in his native Switzerland. In use, the Beetz basket design, shown in these illustrations, is filled with fresh-cut flowers adding color to the icy work.



## Statistical Control



QUALITY, according to the dictionary, means that something has a natural or built-in excellence or superiority of kind. Although it can mean many things to different people, most engineers have settled on a definition that includes several elements. One

is that mechanical equipment must be well engineered and that, in turn, means such things as conservative ratings (one well-known construction man says that he considers a quality machine as one having the capacity, as does "a good man," of giving just a little more when the going gets tough), minimum maintenance in service and efficient use of power.

Attaining quality, even in well-engineered products, is a matter of great concern to all involved. In many cases it depends on the care and thoughtfulness of the man operating a machine tool or the one assembling the product. Mass production, for obvious reasons, compounds all the problems. The perplexing situation is a man-made one, but often one that can be solved by the imaginative design and application of tools. Before this can be done, however, it is necessary to pinpoint each particular source of trouble. Statistical quality control is one means of doing this that has gained great favor in recent years, especially among manufacturers of mass-produced goods. Our lead article this month tells of a part of the quality control program at a leading automobile manufacturer's plant.

**T**HEORETICAL quality control first assumed shape in the mind of Dr. Walter A. Shewart in 1918. The young University of California Ph. D., had just joined Bell Telephone Laboratories and was assigned to the task of improving the soundproofing of aviators' helmets. Conceiving the idea of using statistics as an aid to reducing the number of sizes of helmets that had to be made, he reasoned that determining the average-sized head, as well as the predominance of certain prevalent sizes, would lead to marked economies in helmet production. This led him to a study of statistics and its application to industrial problems. In 1924, he devised an inspection method based on his studies that materially reduced the rejection of certain telephone parts at Western Electric.

**Q**UALITY control replaces or reduces inspection. For every operation carried out under quality control, there is a chart. It resembles a temperature graph covering several days or weeks, with its line indicating devia-

tions from normal limits. On the quality control chart there is also an "average" line, but it corresponds to the exact result wanted. Above and below it are limit lines that represent allowable errors, or tolerances. As long as the results of any given operation fall consistently within these boundaries, the operation is satisfactory.

It is not considered necessary to check each time to see if these criteria are met; instead perhaps only one in five or one in ten is checked. Quality control, however, does give a running record of a product and its defects as it moves from stage to stage. By so doing it provides checks all along the production line, detecting little "bugs" that might otherwise grow into big ones. Thus its chief aim may be said to be to forestall the production of substandard items rather than separating the good from the bad. It is a management device to determine not only that something is wrong, but to find out what is wrong. Then steps can be taken to assure that the fault is corrected instead of just throwing out the bad parts caused by the fault.

An example of the results obtainable is available from the production story behind the Allies' victory in World War II. At the outset, the Army Air Corps had some 16,000 inspectors in plants of its suppliers, in addition to those in its own depots. Even with all of these, it was still impossible to achieve the degree of uniformity required of its war material. Then quality control was adopted, the War Production Board teaching it as a matter of policy. The result was that uniform parts for planes, trucks, tanks and other equipment began to flow to the battlefields in a victory-winning stream. In addition to the attainment of uniform quality, costs were reduced, although this was of less importance in wartime. Today, however, cost reduction is a more important attribute of statistical control methods.

**C**ORRECTION of faults discovered by quality control methods may lie in different manual methods, in a slowing of the operation so that the laborer will have more time to inspect his own work or, if required, a basic change in tooling. In the correction of assembly faults, compressed-air-powered tools are often found to be of aid. They can be obtained with automatic torque-limiting features; their ease of operation reduces operator fatigue, thereby eliminating one source of mistakes; their speed can be utilized to give the operator more time for his task; and, in some cases, they can be equipped to automatically perform boring repetitious tasks with a uniformity of result that cannot be attained by other means.

## Spray Drying

WITH continuing improvements and new techniques, spray drying has become one of the fastest-growing unit operations in American industry. At present, the sale of spray dryers in the United States accounts for some \$6,000,000 annually. Sale of the necessary equipment for the process began to accelerate after the Second World War, after being dormant since the first patent was issued in 1865, and is continuing to improve at a substantial rate.

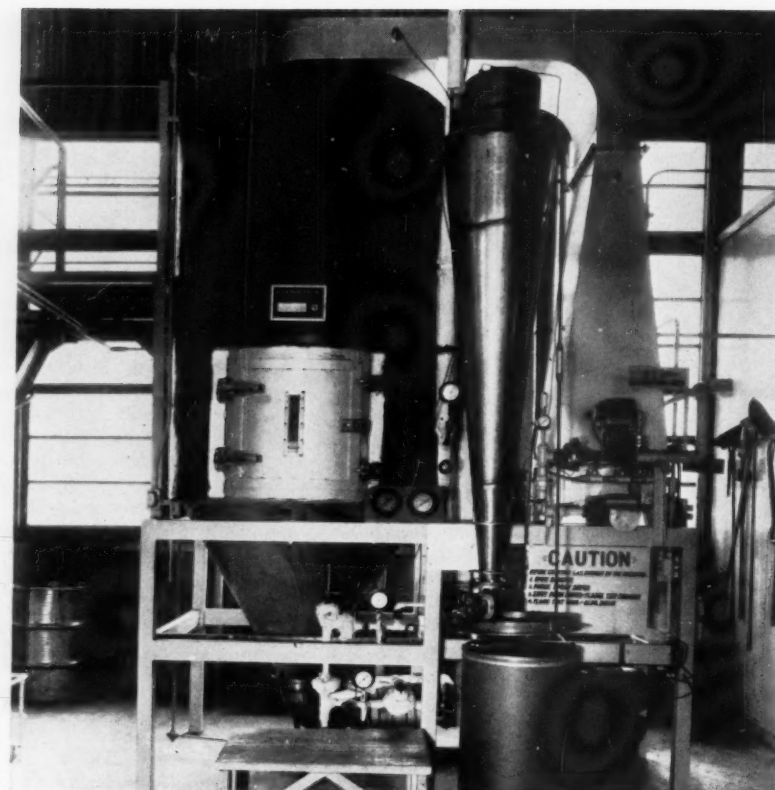
Most materials that can be put into a solution or slurry can be spray dried to the advantage of the user, and new applications of the process are developing rapidly in the fields of chemicals, plastics, ceramics, pharmaceuticals, metals, foodstuffs, pigments and the like. The process assures pure, uniform, homogeneous particles.

In this accelerated trend towards spray drying, American Cyanamid Company has played a major role of leadership. Cyanamid's first installation, designed and fabricated by Bowen Engineering, Inc., of North Branch, N. J., was operating prior to World War II. Additional dryers were put into operation during the war; and since then, their use by the company for drying an ever-increasing variety of industrial chemical products, has continually expanded.

About 5 years ago, following extensive initial testing at Bowen laboratories, Cyanamid's Bound Brook plant installed a laboratory-sized dryer for further exploratory investigation of the various materials used in its manufacture of dyes, pigments, plastics, plastic resins, textile resins, rubber chemicals, pharmaceuticals and other organic and inorganic compounds.

With this unit, an evaluation of the potential advantages of spray drying, as compared with other methods then in use, was possible. Following a decision to replace a continuous belt dryer in its Organic Chemicals Division with a production-model dryer unit, special tests were carried out by Cyanamid, in conjunction with Bowen engineers, with larger-capacity equipment to determine essential production design data. Among other findings, it was established that a spray dryer with a 14-foot-diameter drying chamber was required. The unit was installed 2 years ago. After final operating adjustments were made, the dryer has been operating around the clock, 7 days a week, handling 45- to 50-percent slurry.

In operation, filtered slurry is fed into the drying chamber and atomized into



a fog-like mist by a centrifugal wheel operated at 20,000 rpm. A fan at the end of the collection cycle creates the suction that pulls the almost-instantaneously dried product through the system, simultaneously swirling in the drying air stream.

The heated drying air enters around the centrifugal wheel, picking up the falling droplets. Before they have fallen as much as a foot, a dehydration process has taken place, converting the droplets into moist particles, despite their rapid descent. Further dessication to the homogeneous, uniform-particle powder form occurs during the fast movement through the drying chamber to collectors. (No deleterious effects result from the heat of the drying air, since the cooling effect of the evaporation process keeps the product comparatively cool.)

The dried product is collected in a cyclone collector. The entire operation is instrument-controlled, and readings need be taken only once an hour during continuous operation, because special means have been provided for alerting the operator in case of any mechanical failure. From the time the feed is introduced until it is collected as the finished product, the material spends only a matter of seconds in the system.

Comparing present methods of operations with the belt drying system, Cyanamid has found that spray drying halves labor requirements, substantially

reduces maintenance costs and increases both product yield and quality. The dust problem, which was ever-present during belt drying, has been completely eliminated because the entire system operates under suction.

Because the production spray-drying operation was so successful, a second 4½-foot-diameter drying chamber was installed at a Cyanamid pilot plant last year. The company uses it for test operations on a wide variety of materials. Usually the material tested in the second unit has first undergone a series of tests in the laboratory unit.

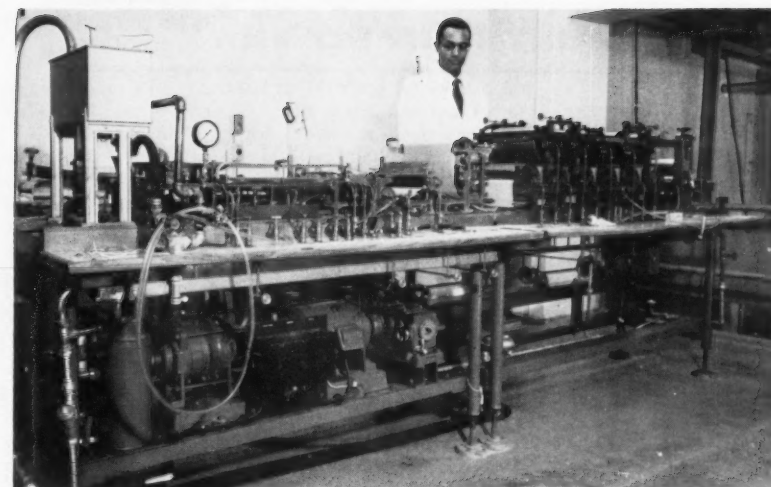
Basically, the operations of all Bowen dryers are the same, despite their differences in size. Wet feed is introduced at the top and drying air is introduced around the atomizer. The air currents rapidly dry the highly atomized feed, and the dried product is conveyed by suction to the cyclone collector, or collectors, where it is discharged for packaging, storage or further handling. The drying chambers of the Cyanamid units are cylindrical, with conical bottoms. All are constructed with stainless steel interiors.

Cyanamid's equipment is such that they can experiment with a number of variations in spray drying techniques. Both centrifugal-wheel and nozzle methods of feed atomization can be used and, when desired, tests using countercurrent air introduction can be conducted.

## Lamination Process Yields A New Type Of —

# MAP PAPER

**P**ILOTS of soon-to-appear jet airliners may one day have a more precise idea of where they and their passengers are located because of an improved map paper developed by the U.S. National Bureau of Standards. The new material has two characteristics that are prerequisite to high-quality maps: it expands and contracts but slightly with changes in moisture content; and its small expansions and contractions are uniform in all directions. Papers that shrink or become decidedly larger when the humidity varies can cause confusing misregister of colors during printing. If the amounts of expansion or contraction



### PAPER-MAKING MACHINE

Paper stock of only 2-mil thickness was produced with this miniature Fourdrinier paper-making machine for the U.S. National Bureau of Standards' map paper experiments. The thin stock was laminated to both sides of a plastic inner layer to form an improved map material.

present are not uniform, distances will be inaccurately represented.

The new paper consists of two extra-thin sheets of paper laminated to both sides of a plastic film of polyethylene terephthalate. A special 2-mil map paper (conventional map paper is about 4 mils thick) is used with plastic of either

0.5- or 1-mil thickness. The plastic was chosen because it adds strength and has desirable dimensional stability. Aside from having good expansion qualities, the resulting paper has more tear resistance and can withstand more folding than conventional types.

The fibers of machine-made map papers tend to fall lengthwise on a moving wire mesh as the paper is formed. This line of strain is called the "machine direction." When the wet material is pulled from the mesh through dryers, it is strained both in the machine direction and in a right-angle "cross direction" by the machine's restraint on its shrinkage.

Expansivity of the new paper was tested for relative humidity changes between 90 and 75, 90 and 65, 90 and 50, and 65 and 50 percent. An "optical lever" measured the tiny differences. In the 15-percent change between 65- and 50-percent humidity (the conditions required by Federal map paper specifications), cross direction expansivity of the 1-mil-film paper was 70 percent less than that of conventional maps. Machine direction expansion was reduced about 30 percent. These reductions formed a nearly "square" sheet, that is, one with equal expansion in both directions.

It is expected that due to high production costs, special military maps and charts will be the chief current use for the paper innovation. The experiments were carried out by Gerald L. McLeod and Thelma L. Workman of the Bureau's paper laboratory. The U.S. Army Corps of Engineers Research and Development Laboratories sponsored the project; the Corps of Engineers is the Army branch responsible for map production.

## "RUBE GOLDBERG" GARAGE

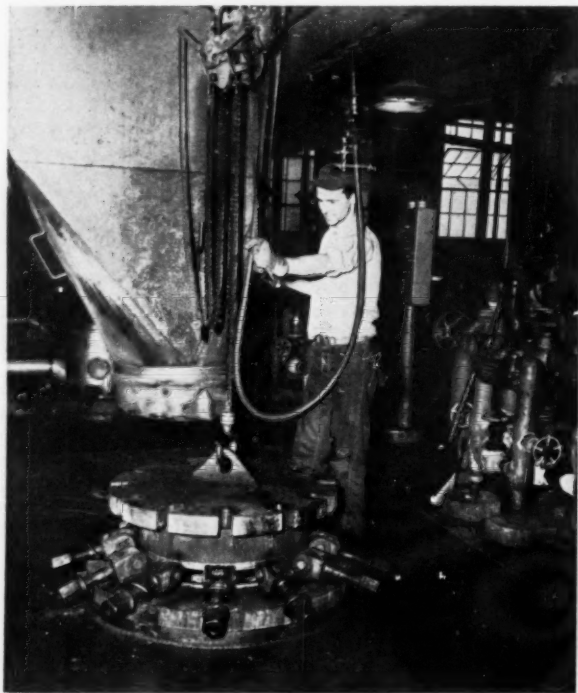


PHOTO, SWISS NATIONAL TOURIST OFFICE

**P**USH-BUTTON parking is rapidly spreading throughout the world. The latest installation is an 8-story garage adjoining Hotel International in Basel, Switzerland. A car arriving at the Autosilo, as it is called, is assigned to a receiving bay from the control desk. After putting his car in the proper bay, the driver simply presses a button. Electrical impulses open and close doors, and cranes and conveyors gently lift and deliver the car to the designated floor and the exact spot in which it is to be parked. When leaving, the operation is reversed. As the automobile reaches the ground-level delivery bay, a computer tallies the amount of time it was parked and the fee to be charged.

Autosilo represents a vast network of automatic safety devices. Between each phase of the operation, cables, conveyors, lights, switches and buttons are checked electrically and mechanically. To put the building into operation required 375 miles of control cable and 150,000 soldered joints. Total cost for the 3½-year construction job was \$3,600,000; today, drivers can park for about 25 cents for the first 1½ hours, and a like sum for each additional hour.

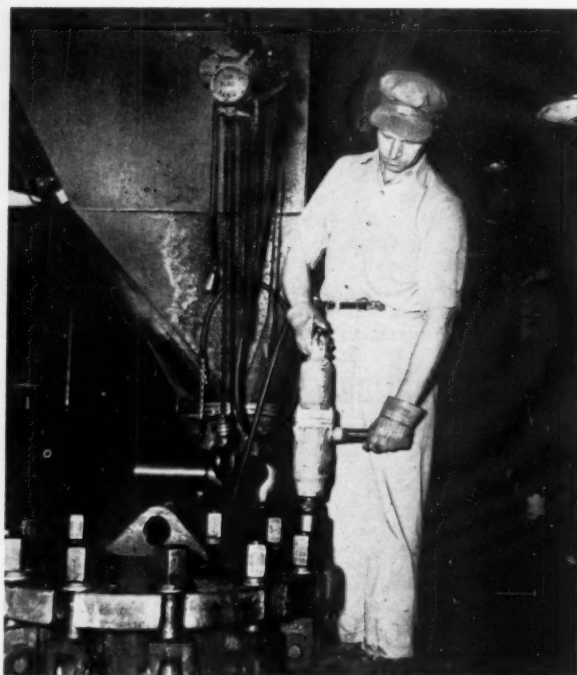
### *Two Air-Operated Tools Team To—*



#### REMOVING CAP, TIGHTENING NUTS

A 750-pound digester cap is moved easily (top) by the Ingersoll-Rand RC-10 Air Bloc hoist hooked to an eye in the cap top. The 2¾-inch bolts are lying in horizontal position around the base of the opening. A chip hopper is shown to the left of the hoist and operator. An Ingersoll-Rand Size 534 Impacttool at work on the large fasteners that hold the cap to the digester opening is shown in the illustration at the right. Use of the air impact wrench allows faster, less strenuous tightening and loosening of the nuts, and is much safer than a 4-foot-long wrench.

### Cut Charging Time In Half



ONE of the key operations in a southern United States paper company's process is the charging of its ten digesters with wood chips that eventually become paper. Some 40 times a day, two men position one of three supply hoppers over the digester openings for the charging operation. The caps to the digesters are thick, 750-pound metal wafers that are held tightly over the openings by twelve, 2¾-inch bolts. These bolts are affixed permanently to the base of the opening, and, before being tightened, pivot up, fitting into slots provided in the heavy caps.

By utilizing two Ingersoll-Rand air-powered tools, the time required for removing and replacing these lids was halved. The older method, applied to

the oft-repeated procedure, utilized a hand chain fall, after the dozen nuts had been loosened by a 4-foot-long end wrench. The cap was lifted from the opening, then it was temporarily positioned out of the way of the hopper. After charging, the chain fall was again used to lower the cap in place and the long manual wrench used to tighten the fasteners.

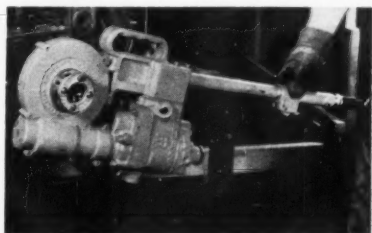
To cut this time-consuming operation in half, thereby doubling the amount of time the two operators have available for other duties, an Ingersoll-Rand RC-10 Air Bloc hoist was installed on each of the three supply hoppers for raising or lowering the lids. Between each two digesters, an Ingersoll-Rand Size 534 Impacttool was placed for quick loosening

or tightening of the nuts. Hansen couplings were mounted on all air lines to allow quick connection or disconnection of the I-R hoists and freedom of hose movement to operators using the Impacttools.

With the older method, the time required for taking off a cap and replacing it was 10 minutes. Only 5 minutes are needed, now that the air tools are in operation. Figured at the labor rate of \$1.50 per hour, the old method cost \$20 per day; the new, \$10. Too, the job is much safer with the air tools, and the physical effort on the part of the operators is much less, an important factor for increasing worker efficiency in the hot and humid atmosphere of the digester room of this southern facility.

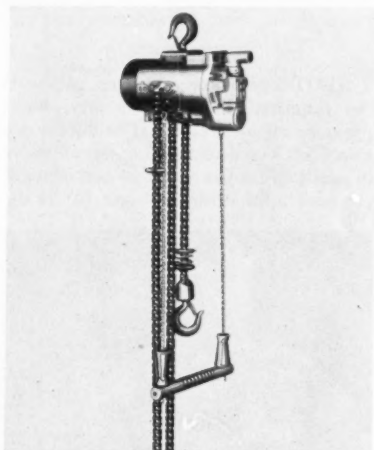
## Industrial Notes

**AIR-POWERED** pipe threaders, manufactured by Lawco, Inc., are especially suitable for piping installations that must be done in hazardous areas where combustible gases and vapors are present. The unit utilizes an Ingersoll-Rand Size 22K air motor for powering the mechanism. It weighs only 22 pounds, but is of sturdy construction to withstand the most severe use in thread-



ing from  $\frac{1}{8}$ - to 8-inch pipe. Other features are said to include convenient, dependable service, and little maintenance with occasional inspection of the oil reservoir. The tool is not only equipped with a sensitive throttle and handle for ease of operation, but is also reversible for special applications. The versatile tool can also provide portable power to drill, auger, operate valves, drive a winch and the like. *Velocity Power Tool Company*, 201 North Braddock Avenue, Pittsburgh 8, Pa.

**AIR HOISTS**—designed by Ingersoll-Rand Company to be easily moved and installed by one man—conserve time, reduce operating costs and ease the operating schedules of shop cranes. Capacities of the line range from 200 to 24,000 pounds; the newest two models have



capacities of 1000 and 2000 pounds. The former, designated as Size MR-10 weighs 39 pounds and lifts its rated load at 45

feet per minute. The latter, Size ML-20, weighs 56 pounds and can lift its rated load at 22 feet per minute. Both are made of lightweight aluminum alloy and measure  $12\frac{1}{2}$  inches over-all, and  $5\frac{1}{4}$  inches in diameter. A mechanically operated brake is applied automatically whenever the controls are released; and if the air supply should be shut off, the lowering of the load may be controlled by the same brake. Safety up-and-down stops prevent damage to the hoist from overrun of the chain in either direction. According to the company, these two

units also feature a built-in lubrication system for protection of the motor and gearing. Because the vane-type motor is at one end, the other being made up of the gearing, it can be serviced independently. The motor is of the 7-vane type and offers high capacity with low weight. It cannot burn out, even when completely stalled. As with all the other units in this I-R line of hoists, the motors are completely enclosed, eliminating maintenance and operating costs caused by dirt, vapor, heat, moisture or air-borne foreign substances in the motor

### NEW SILENCER for air exhausts



High noise levels are effectively reduced by a new silencer developed by Air-Maze Corporation. Fits directly to exhaust ports or piping. Breaks up shock waves to attenuate objectionable noise without noticeably impairing efficiency

of air operated equipment.

Standard sizes for  $\frac{1}{8}$ "-  $\frac{1}{4}$ "-  $\frac{3}{8}$ "-  $\frac{1}{2}$ "-  $\frac{3}{4}$ " pipe sizes.

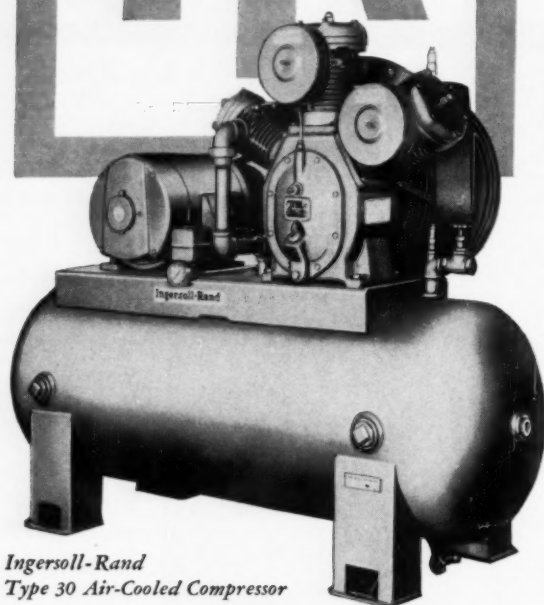
Write for details in Bulletin KK-657, **THE AIR-MAZE CORPORATION**, Cleveland 28, Ohio. Department CA-10.

## AIR-MAZE

*The Filter Engineers*

AIR FILTERS • SILENCERS • SPARK ARRESTERS • LIQUID FILTERS  
OIL SEPARATORS • GREASE FILTERS

**eliminate  
costly  
down time**



*Ingersoll-Rand  
Type 30 Air-Cooled Compressor*

Ingersoll-Rand Type 30 air-cooled, air compressors have shown, time and again, that you can install and forget them except for periodic checks. Rugged construction and special design features give these compressors outstanding durability that never lets you down. Exclusive features pioneered by Ingersoll-Rand and proven through years of performance add economical operation — more air per horsepower.

I-R Type 30 Compressors are available from ½ through 20 hp; bare, baseplate or receiver mounted. Write for detailed information.

**Ingersoll-Rand**  
3-804 11 Broadway, New York 4, N. Y.

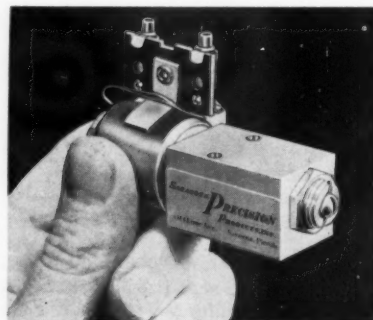
chamber. Thus, these units are ideally suited to tool and die shops, foundries, forge shops, machine tool plants, assembly lines and the like. *Ingersoll-Rand Company, 11 Broadway, New York 4, N. Y.*

**A** PROTECTIVE device for force-feed lubricating systems is called Lube-Line Alert. It is installed at each terminal point of lubrication by simply cutting the line and connecting the fittings. The unit is then connected electrically to any desired audio, visual or mechanical warning device, which may include a bell, whistle, horn, master control-board light or even a relay to shut off the



motor. If the flow of lubricant through the unit is interrupted for any reason, the signaling system is activated. It is said that the alert system is usable with any viscosity oil or synthetic lubricant with pressures to 10,000 psig. Explosion-proof units are also available for use where conditions require them. *Manzel, 315 Babcock Street, Buffalo 10, N.Y.*

**P**ILOT operation of larger valves is the function of a low-capacity, high-pressure solenoid valve. The device can also work as a direct-acting, on-off valve in small hydraulic systems, and in high-pressure lubricating systems. It is de-



signed for 3000-psig pressure, passes 17 cubic inches of fluid per minute with a pressure drop of 100 psig, and weighs 4½ ounces. It handles kerosene, and hydraulic and lubricating oils. The manufacturer claims the hardened, ground and lapped poppet and seat assure no leakage in the "off" position. Models for 6 to 48 v d-c, and 110 v a-c are offered. *Sarasota Precision Products, Inc. 1312-14 Lime Avenue, Sarasota, Fla.*

**A**CCESS LIFTS manufactured by Ballymore can now be operated in petroleum, chemical and other plants where the atmosphere is, at times, explosive. They have been equipped with air-motor drives for their hydraulic pumps. An air hose, from existing plant air lines, is attached to the lift and the pressure turned on. Push-button control, located on the platform guardrail, gives the mechanic complete mastery over rising, stopping and lowering operations. They can reach a maximum of 42 feet above the floor with ease, speed and safety. In addition, the lifts are said to be easily transported from one location to another because they can be folded to pass through narrow corridors, on elevators and the like. In operation, maximum stability is assured by screw-type leveling jacks at each corner. The platform area is 2¼ feet square, the platform load is rated at 350 pounds, and it is equipped with 3-foot-high guardrails. It can be rotated through 360 degrees. *Ballymore Company, Lincoln and Garfield avenues, West Chester, Pa.*

**P**ROTECTION against splash, spray and impact exposures is received from a safety goggle particularly recommended for use in the chemical industry and where humidity is high. The goggle is indirectly ventilated; there are no open-



"I understand the big boss himself is in town."

## A 125 H.P. Brook A.C. Motor Is **NOT** Almost 125 H.P.

When you purchase a Brook Motor of a given horsepower, that is just what you get. You need not buy 150 H.P. to make sure you get the 125 you require. Every Brook Motor has ample "copper" to deliver the particular horsepower involved — every Brook Motor is dynamically brake tested. You just cannot buy a better motor — yet, Brook Motors cost you up to 20% less than ordinary electric motors. Get the facts — send for literature. Standard frame and new NEMA Rerate frames. 1 to 600 H. P. Warehouses and Service Centers in major cities.

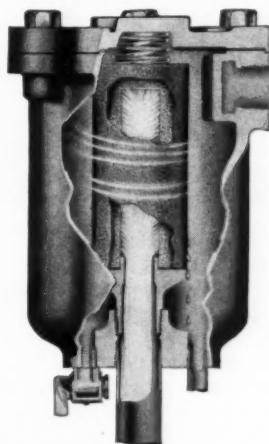
world's most respected motor  
**BROOK MOTOR CORPORATION**

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In Canada: BROOK ELECTRIC MOTORS OF CANADA, LTD.  
250 University Ave., Toronto, Ontario.



## ADAMS PORO-STONE AIR FILTER

designed to remove oil, water and foreign matter from compressed air lines with minimum pressure drop.



The R. P. Adams Poro-Stone air filter is engineered to efficiently remove entrained oil, water and pipe scale from compressed air lines. Liquid

droplets and solids being carried by the gas stream are first removed by centrifugal action in an annular chamber. Secondary filtration is achieved by passing the air or gas stream through a Poro-stone unit. An automatic trap can be provided to discharge the residue from the cyclone chamber.

At rated capacity the filters operate at a maximum pressure drop of only ½ lb., thus insuring delivery of line pressure to the point of consumption. The units require virtually no service or maintenance — thereby insuring continued trouble-free, low cost performance.

ADAMS Poro-Stone air filters are available from stock in sizes to suit your needs. For further information, write today for Bulletin 117, R. P. Adams Co., Inc., 209 East Park Drive, Buffalo 17, New York.



ings in the frame or holes in the lens. It is said that tests have shown the unit to be twice as fog free as other glasses. The goggle frame is molded from clear vinylite plastic and is nonirritating and non-toxic. The frame is designed to fit over

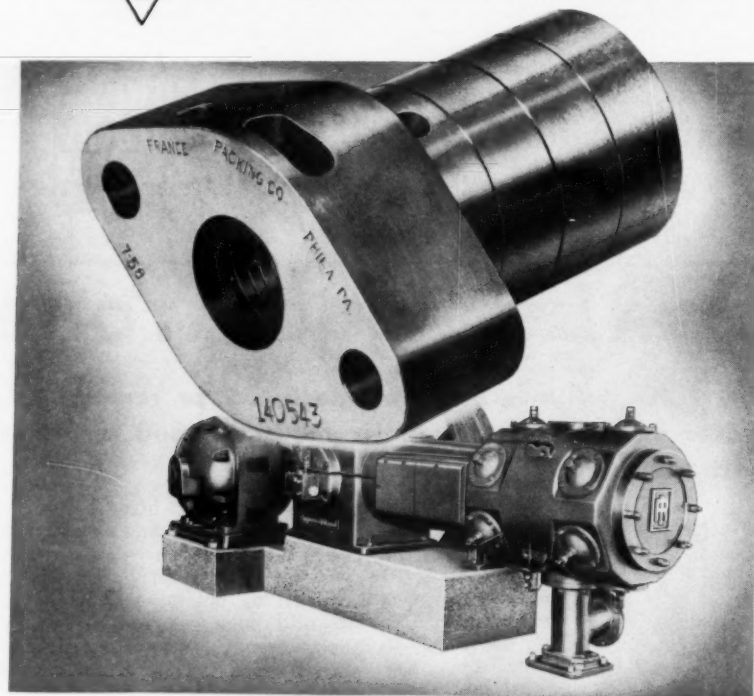
all safety and prescription glasses. The 1-piece lens, available in clear or green-colored types, is made of impact-resistant acetate. The goggle reportedly is lightweight, comfortable and allows wide-angle vision. An all-rubber head band holds it firmly in place. *American Optical Company, Safety Products Division, Southbridge, Mass.*

**E**FFICIENCIES of operators, machines and processes are indicated simultaneously and continuously by a single line inscribed on a plastic-covered chart by a device called Efficiency Recorder. The chart shows both productive time

and down time, and is said to be readable for constant use through periods of 31 days. Efficiency is shown as a percentage number, and represents the figure determined by dividing the time actually used by that which is available. The chart is fastened to a constantly rotating aluminum drum, driven by a constant-speed electric motor. Its inkless stylus moves upward during productive time. During down time, the stylus travels horizontally; to make this down time



**SYMBOL OF  
QUALITY  
AND PERFORMANCE**



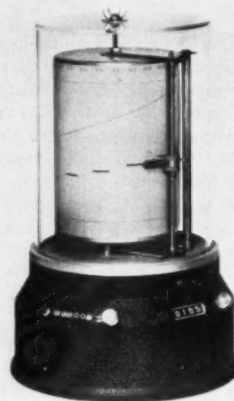
France Packing as used in the Ingersoll-Rand ESH and ESV compressors provides the ultimate in compact and efficient packing. Advanced design in keeping with industrial development has been the hallmark of France Packings for 60 years.

Product superiority combined with excellent field service by experienced engineers are reasons you should specify "France" on new equipment or as replacement packing for existing units.



**FRANCE PACKING COMPANY**

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conspicuous, an accessory stylus marks an extra-bold horizontal line. The Recorder can be attached to almost any moving machine by using electrical connections, vibration switches, electric eyes and similar devices. The Recorder indicates such things as when a punch press is actually working, or when it is merely "cutting" air; it knows when a bookkeeping machine is in use and not simply running its electric motors. An accessory subbase has two counters, one of which indicates the total elapsed minutes of productive time; and a second, the number of times the process was started and stopped. *Gorrell & Gorrell, Westwood, N. J.*

**I**NTERNAL and external chucking are possible with Stace Model 41A air chuck, that is said to achieve its versatility by means of a 1x1 5/8-inch cap located on the outside diameter of the device. Reversal of the chucking direction can



be accomplished by simply removing four screws from this cap, and rotating it 180 degrees, and then replacing the screws. A large variety of jaws is available, and a precision-tooled registering ring is provided for quick installation of formerly tooled chuck jaws. Thus, the jaws may be removed and saved for future work. The model uses a self-contained air chamber that eliminates the need for an external pressure chamber and draw-bar arrangement. Adjustment of a pressure regulator in the air line provides the desired chucking pressure, which is maintained until the regulator is readjusted. Tolerances can be held within 0.0005 T.I.R., and it is said accuracies of as little as 0.0002 are possible. *Crodian & Company, 4877 Kessler Boulevard, East Drive, Indianapolis 20, Ind.*

**K**AOBESTOS is a rubber-asbestos material that reportedly gives improved conformability and tighter sealing qualities with minimum flange loadings. Gasketing for heat exchangers, compressors and diesel engines are among its wide variety of applications. It is made by uniformly dispersing and coating with rubber millions of individual fibers per ounce of asbestos. Thus, it has an absence of high and hard spots. It is available in two grades of GRS, in Buna N and in neoprene. Sheet sizes are as large as 60 inches square and have thicknesses ranging from 0.015 to 0.125 inch. According to the manufacturer, where heavier thicknesses are required, thinner ones can be laminated. *F. D. Farnam Company, 4940 West Flournoy Street, Chicago 44, Ill.*

**A**IRSONIC is the name of an industrial stethoscope made in Belgium. Because it is nonelectric and has no dia-



"He's Chief Engineer here, and he won't let anyone forget it!"

## This NUGENT FILTER will handle pressures to 3000 P.S.I.



Here's big news from the pioneer of fluid filtration. The Nugent Co. introduces the latest addition to their line of fine products . . . a completely new series of Laminated Fiber Disc Filters. Designated as 1555CP, they are designed for hydraulic and other high pressure applications.

Constructed for 3000 psi working pressure, they comply with the requirements of the ASME Code for Unfired Pressure Vessels. API or ASME code inspection and stamping is available.

Five sizes are available with capacities ranging from 1.5 GPM at 3 psi pressure drop to 47.6 GPM at 6 psi pressure drop when filtering 100 SSU viscosity mineral oil. For installations requiring larger capacity, the filters may be connected in multiple. Inlet, outlet and drain are located in the bottom of the filter.

For complete information on 1555CP filters, write today . . . or if your job is *RUSH*, phone ORchard 4-8121, Skokie, Illinois. Our engineers will help you.



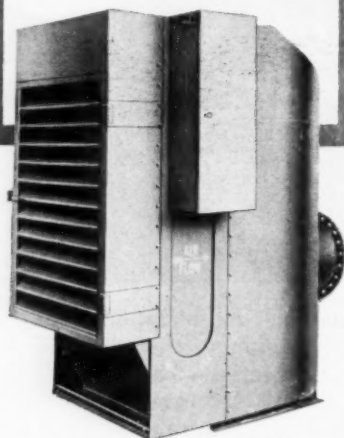
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OILING AND FILTERING SYSTEMS • OILING DEVICES  
SIGHT FEED VALVES • FLOW INDICATORS

# AAF Multi-Duty Filters Assure Clean Intake Air Automatically



Type CMS Multi-Duty for air volumes of 3000 CFM and up.

When your engines and compressors are protected by AAF Multi-Duty Self-Cleaning Filters, you *know* that intake air is *clean*.

Uniform air delivery, constant efficiency, low operating resistance and infrequent maintenance are "musts" for true dust protection. Multi-Duty measures up on every count because this filter keeps itself "fit" through continuous self-cleaning action.

Would you like more information? Write today for our 16 page illustrated catalog.

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American Air Filter  
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phragm, it has no fixed frequency of its own and is reportedly capable of picking up sounds of all frequencies, and reproducing them at the desired volume. In addition to testing machinery in operation, the device can also be used for checking and detecting leaks in gas and water pipelines, hydraulic systems and testing the soundness of castings and welded joints. The unit has an interchangeable horn and probes that are said to permit isolation of sounds, knocks, rubs, grindings, taps, vibration and leakages of air or gases in bearings, gears, shafts, valves, pistons, rods, feed lines and the like. It is applicable to pumps, gasoline and diesel engines, compressors, generators, turbines, steam boilers, electric motors, precision instruments and a wide variety of related machines. *M. Paquet & Company, Inc., 17 Battery Place, New York 4, N.Y.*

**N**ICKEL-PLATED brass is used in the construction of single-tube Fulflo Filters designed for cleaning compressed air. The use of this metal, it is said, eliminates any possibility of iron contamination or rust. Seven-inch honeycomb filter tubes provide true-depth filtration to minimize gumming and remove moisture, oil, microscopic rust and dirt particles. Flow rates for the fixtures are 50, 70 and 76 at 40-, 80- and 100-

psig pressures, respectively. A streamlined head with a single, center bolt



reportedly allows speedy servicing. The filter is available with or without mounting brackets for 3/8- or 3/4-inch pipes. A wide range of honeycomb tubes is available. *Commercial Filters Corporation, Melrose, Mass.*

## NO MORE MOISTURE PROBLEMS



When you use

**NON-FLUID OIL**  
TRADE MARK REGISTERED

The problem of moisture content in pneumatic tools is solved by the use of "NR" Grades of NON-FLUID OIL. This superior lubricant gives complete rust protection by emulsifying with airborne moisture, without losing any of its lubricity. Its affinity for metal surfaces prevents fogging and blow-out losses . . . even in the lighter grades with a pour point of -30°F.

Leading makers of air tools and equipment use and recommend continued use of "NR" NON-FLUID OIL.

Try NON-FLUID OIL yourself and be convinced. Free testing samples and a copy or instructive Bulletin 550 will be sent on request.

## NEW YORK & NEW JERSEY LUBRICANT COMPANY

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WORKS: NEWARK N. J.

Birmingham, Ala. Columbus, Ga. Greenville, S.C. Springfield, Mass. Detroit, Mich.  
Atlanta, Ga. Charlotte, N.C. Chicago, Ill. Greensboro, N.C. Providence, R.I.  
St. Louis, Mo.

# Industrial Books And Literature

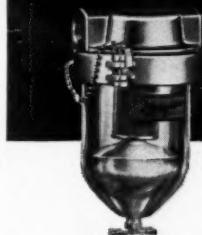
AMERICAN Welding Society has announced the availability of Section II of the fourth edition of the *Welding Handbook, Gas, Arc & Resistance Welding Processes*. (Section I dealt with the fundamentals of welding and was reviewed in COMPRESSED AIR MAGAZINE, September 1957.) The publication is divided into five sections, one of which will be published each year until the volume is complete, at which time a revision of the whole will begin again, proceeding on an annual basis. Section II contains thirteen chapters, each with a comprehensive bibliography and its own table of contents. Processes of a similar nature are grouped together and followed by a chapter describing the various types of equipment and accessories available. The following list of topics indicates the scope of the second part: gas welding; pressure gas welding; gas welding and brazing equipment; shielded metal-arc welding; bare metal-arc welding; impregnated-tape welding; atomic-hydrogen welding; inert-gas metal-arc welding; submerged arc welding; arc welding equipment; spot, seam and projection welding; flash, upset and percussion welding; and resistance welding equipment. Each has been written by an acknowledged expert in the field. Cost, \$9. American Welding Society, 33 West Thirty-ninth Street, New York 18, N. Y.

COUPLINGS are described in a general catalogue that includes five basic types of the quick-connect, quick-disconnect units. The five basic couplings are: the H coupling for high pressure applications; the IH, for impact in air lines; the Hi-Flow, for low-pressure applica-



"I've got three kids too, Murphy... and a butler and three maids, and four Irish setters that eat like horses!"

Comparative tests  
prove *Norgren*  
**AIR LINE FILTERS  
SAVE  
MAINTENANCE  
TIME**



## No Tools Required... Fewer Parts to Handle

Compare **Norgren** with other makes of manual drain filters. All others require tools to take them apart...then there are a dozen or so loose parts—easily dropped and lost, and likely to be improperly reassembled. Not so with Norgren Filters. No tools are needed for maintenance and there are only four parts to reassemble. Maintenance is simple...an easy job for anyone. This means a big saving in maintenance time and money.

MAKE	NORGREN	A	B	C	D	E
LOOSE PARTS TO DISASSEMBLE	<b>4</b>	9	15	13	6	12
TOOLS REQUIRED FOR MAINTENANCE	<b>NONE</b>	Wrench	Wrench & Screw-driver	Screw-driver	Wrench	Wrench & Pliers
TOOL OPERATIONS REQUIRED	<b>NONE</b>	2	10	16	2	4

*If it's Norgren...It's Dependable.*

For complete information  
call your nearby Norgren  
Representative — or write  
for descriptive literature.

**C. A. NORGREN CO.**

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tions; the E, for vacuum and very low pressures; and the T coupling for hard to handle fluids. The publication illustrates construction details of all couplings by use of cross-section drawings. Spare parts, dimensions and accessories are pictured and described. Flow and pressure drop data for the H and IH units are provided by means of graphs and tables. Also listed are fifteen available coupling packers along with the temperature range and usage for each. *Snap-Tite, Inc., Union City, Pa.*

ZIRCONIUM and titanium are the subjects of two recently published reference bulletins. In addition to listing the mechanical and physical properties of these

metallic elements, the booklets also include the effect of temperature of zirconium, the corrosion properties of zirconium, titanium and other metals; tips on fabrication; and application possibilities. *Mallory-Sharon Metals Corporation, Niles, Ohio.*

REMOVAL of dirt, rust, paint and other foreign materials from drum exteriors and interiors by Rotoblasting is described in Bulletin No. 220, published by Pangborn. It explains how the company's ES-382, automatic drum-cleaning machine operates with a single Rotoblast wheel. Automatic loading techniques of 30- to 55-gallon drums, production cost studies, operator safeguards,

engineering specifications and diagrams that show how drums are cleaned inside and out, are also given. *Pangborn Corporation, Hagerstown, Md.*

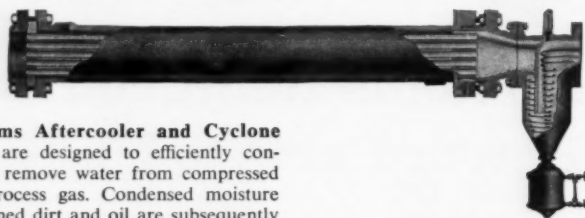
LEFAX publishers announce a revised 1958 catalogue of their pocket-sized technical data books that cost \$1.25 each. These handy volumes cover every field of engineering and are of constant use to engineers, technical men, surveyors, shopmen, teachers and students. They contain about 140 loose-leaf pages of up-to-date material in concise and comprehensive form. A partial list includes *Machine Design, Machinists Data, Mechanics of Materials, Metals, Power Transmission Machinery, Physical & Thermodynamic Data, Hydraulics, Transformers, General Mathematics, Metallurgy and Conversion Tables.* *Lefax Publishers, Sheridan Building, Philadelphia 7, Pa.*

SILVER-SENSITIZED paper, films and cloths used by industry in the reproduction of engineering drawings, templates, etc., and for silk screen, visual projection, offset duplicating and in other reproduction techniques are indexed in a 48-page booklet called *Photographic Materials for the Reproduction Field*. The materials listed are arranged in five basic classifications: paper; films, acetate, etc.; relatively stable polymer films; linen and glass cloths; and pressure-sensitive template-emulsion adhesive papers. These are further classified according to speeds and types of emulsions. Cost, \$1. *Association of Photo Sensitizers, Inc., 51 East Fifty-seventh Street, New York 22, N.Y.*

SILVER-SENSITIZED paper, films a 15-page booklet available from Ansul Chemical. Pointing out that it is essential to many widely different industries, the publication discusses this chemical at length, giving the answers to questions most often asked by manufacturers and

## Aftercooler and Cyclone Separator designed for cleaner, dryer compressed air

R. P. ADAMS CO., INC.  
209 East Park Drive, Buffalo 17, New York



The Adams Aftercooler and Cyclone Separator are designed to efficiently condense and remove water from compressed air and process gas. Condensed moisture and entrained dirt and oil are subsequently removed in a cyclone type separator. This unit is scientifically designed for maximum removal efficiency over a wide range of flow rates.

For normal use, units are available to cool gases to within 10° F of the temperature of the cooling water. Specially designed units are available to permit a 2° F approach to cooling water temperature, for application where low moisture content is critical.

Adams Aftercoolers and Separators are available from stock to handle 20 - 40,000 cfm with 10° cooling and 25 - 19,200 cfm

where it is necessary to cool within 2° F of the cooling water. Special units can be supplied to suit an unlimited range of requirements. In all cases the maximum pressure loss at rated capacities is ½ psi.

This wide range of sizes enables the economical utilization of Adams Aftercoolers and Separators in virtually all industrial application. For further information on how R. P. Adams' units will solve your compressed air problems and save you money, write today for Bulletin 711.

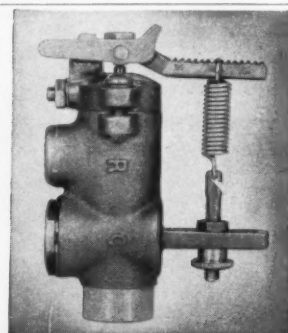
**IT PAYS  
3 WAYS**

*Saves...* **TIME  
PRODUCTION  
PROFITS**

24-hour service . . .  
all makes and sizes . . .  
new valve guarantee.

HOW'S YOUR STOCK OF SPARE VALVES?

## CONRADER'S REBUILT UNLOADER VALVE REPLACEMENT SERVICE



**R. CONRADER**  
BOX 924 • ERIE, PA. **CO. INC.**

research chemists. Included in the subject matter are the physical and chemical properties, specifications and specification test methods, suggested uses, toxicity, and shipping procedures. *Ansul Chemical Company, Chemical Products Department, Marinette, Wis.*

AIR-OPERATED hydraulic pumps of the 10-500 series are described in a 6-page brochure. The units are available in nine sizes, capable of producing from 500- to 25,000-psig hydraulic pressure from a maximum of 100-psig air pressure. Either oil or water may be used as the fluid medium, and the devices are applicable for a wide variety of uses where high pressures, combined with a relatively low flow rate, are required. *SC Hydraulic Engineering Corporation, 6318 Central Avenue, Los Angeles 1, Calif.*

PNEUMATIC cylinders, valves, solenoids, manifolds, fittings and accessories of the miniature variety are detailed in Bulletin No. MA-25. The items described are especially useful for automatic work functions, lightweight manufacturing operations, controls, jigs, dies and fixtures where mounting space and weight are of prime consideration. *Clippard Instrument Laboratory, Inc., 7390 Colerain Road, Cincinnati 39, Ohio.*

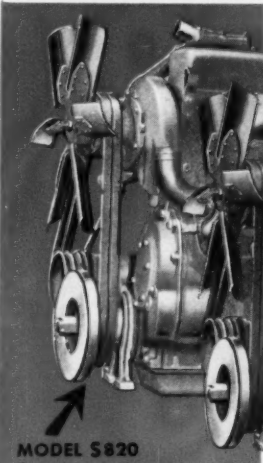
GARLOCK's Bulletin No. AD-163 details the company's line of homogeneous U-cups. The devices are molded of synthetic rubber and have flared side walls that create an interference fit that is especially suited to applications involving sudden pressure changes where instantaneous sealing is needed, or for low pressures. The brochure describes uses, pressures, construction, available sizes and installation procedures. *The Garlock Packing Company, 420 Main Street, Palmyra, N.Y.*



"Discouraging, isn't it?"

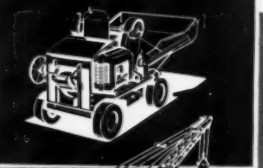
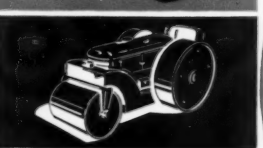
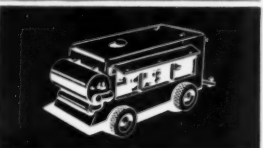
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MODEL S820  
Gasoline

MODEL SD802  
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Power Diesel



## ...CONTINENTAL RED SEAL POWER

More than 100 basic engines, built to 2,000 different specifications, equip Continental with power plants tailored to the requirements of practically every type of construction machinery . . . You're further ahead, all ways, when you standardize on equipment that offers the BIG Extra: dependable CONTINENTAL POWER.

**Continental Motors  
Corporation**

MUSKEGON, MICHIGAN

THE SUN NEVER SETS ON CONTINENTAL SERVICE

45

# ENGINEERING

NEWS YOU CAN USE ABOUT ENGINE AND COMPRESSOR PERFORMANCE



## BIG MEAL FOR CORROSION!

Even in the very toughest service, there's no excuse for rust and corrosion eating away your packing glands. In 999 cases out of 1,000, packing glands of Cook stainless steel or *Ni-Resist* type iron will solve the problem. For the remaining 1 prob-

lem in 1,000, Cook can probably design an answer. That's because C. Lee Cook pioneered in the field of metallic packings—knows more about their specific, on-the-job use than anyone else. C. Lee Cook Company, 952 S. Eighth St., Louisville, Ky.

Rings and  
Packing  
Since 1888



Division of Dover Corporation

*If you don't see  
what you're looking for . . .*

# JUST NAME IT!



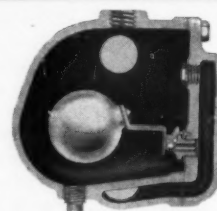
Wood's stocks a wide range of matched V-drive sheaves and belts of all types and sizes for fast delivery. For sheaves of special design or materials (such as ductile iron), we not only will manufacture to your specifications but, because of extensive pattern stocks and modern foundry facilities, may fill your needs at lower cost. For further information and your copy of Bulletins No. 599 (sheaves) and 3100 (belts), contact your Wood's distributor or write:

**T. B. WOOD'S SONS COMPANY**  
CHAMBERSBURG, PENNSYLVANIA

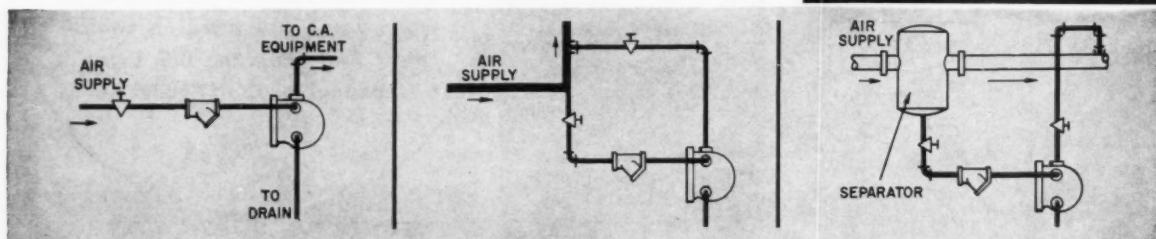
ATLANTA • CAMBRIDGE • CLEVELAND • DALLAS • NEWARK

## INSTALL NEW SARCO FA DRAIN TRAPS

*and get more work from your CA tools*



Cross-section of Type FA Drain Trap showing float design that keeps condensate level above trap, providing seal against air leakage.



TYPICAL HOOKUPS

The typical hookups illustrated here will help you get more useful work from your compressed air tools. Sarco Automatic Drain Traps keep condensate level in trap body above the valve. That maintains a positive seal against air leakage and gives you a steady supply of dry air. Dry air saves maintenance, too, and prevents dam-

age to tools from impaired lubrication and waterhammer. It avoids slowed-down production resulting from freezing in tool exhaust.

Write for "Literature Kit 6A" and get bulletin full of ideas to help increase effectiveness of your present air compressor capacity.

5892-F

**SARCO**  
COMPANY, INC.

635 Madison Ave., New York 22, N. Y.

DRAIN TRAPS • COOLING CONTROLS • SAFETY CONTROLS • IMMERSION THERMOSTATS • STEAM TRAPS • STRAINERS • HEATING SPECIALTIES



## 1250-B BOOSTS YARDAGE FOR WEIRTON

### West Virginia Firm Adds Bucyrus-Erie Walker To Uncover Deep Coal Seams

To reach deeper coal seams, a Bucyrus-Erie 1250-B walking dragline has gone to work in Pennweir Construction Company's open pit mine. Pennweir Construction Company is a subsidiary of Weirton Construction Company. The mining property, covering some 6,000 acres, is on the West Virginia-Pennsylvania border about 25 miles southwest of Pittsburgh.

The 1250-B handles a 33-yd. bucket on a 200-ft. boom to uncover seams of bituminous Pittsburgh Eight running 58 inches thick.

This machine — christened the *Angeline* — brings a substantial yardage increase to the Weirton operation. In addition to moving overburden high and wide, it moves it economically — a tradition of Bucyrus-Erie walking draglines.

Modern front end design combining great strength with light weight permits Bucyrus-Erie walkers to swing big buckets on long booms . . . contributes to outstanding performance. Ward Leonard variable voltage control gives you extra fast acceleration and deceleration for speedy cycles. Exclusive Bucyrus-Erie walking mechanism permits smooth, fast moveups, easy maneuvering to best working position. These features plus month-after-month dependability and low maintenance are your assurance of high production.

To move big yardages economically, choose from the world's largest selection of walking draglines. Contact us for details today. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

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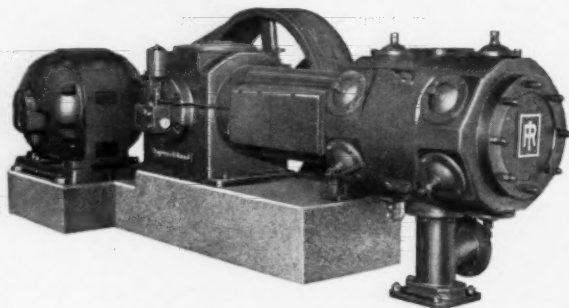


*A Familiar Sign at Scenes of Progress*

# NEW COMPRESSORS

...with heavy-duty features proven in  
larger Ingersoll-Rand compressors

**ESH\*** (horizontal)



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(vertical)



\*The same compressor in either horizontal or vertical arrangement — 20 to 150 hp sizes, single- and multi-stage, pressures up to 5000 psi and vacuums.

**Never a need for adjustments—  
frame is kept sealed!**



**Full-floating  
aluminum bearings  
never need adjustment**

The full-floating bearings "roll with the punch," taking each thrust on a different portion of the shell. They are foolproof, and never require fitting or adjustment. Main and crankpin bearings are made of I-R's special aluminum bearing alloy, which has higher load capacity and better heat conductivity than other bearing materials.



**Air-cushioned  
Channel Valves give  
unmatched performance**

Known the world over for lasting efficiency, dependability and quiet operation, Ingersoll-Rand air-cushioned Type A Channel Valves are entirely different in design and principle from any other valves in use. Type A Channel Valves were developed especially for modern compressor speeds, and feature a separate stainless-steel seat plate which can be reversed or replaced for new life.

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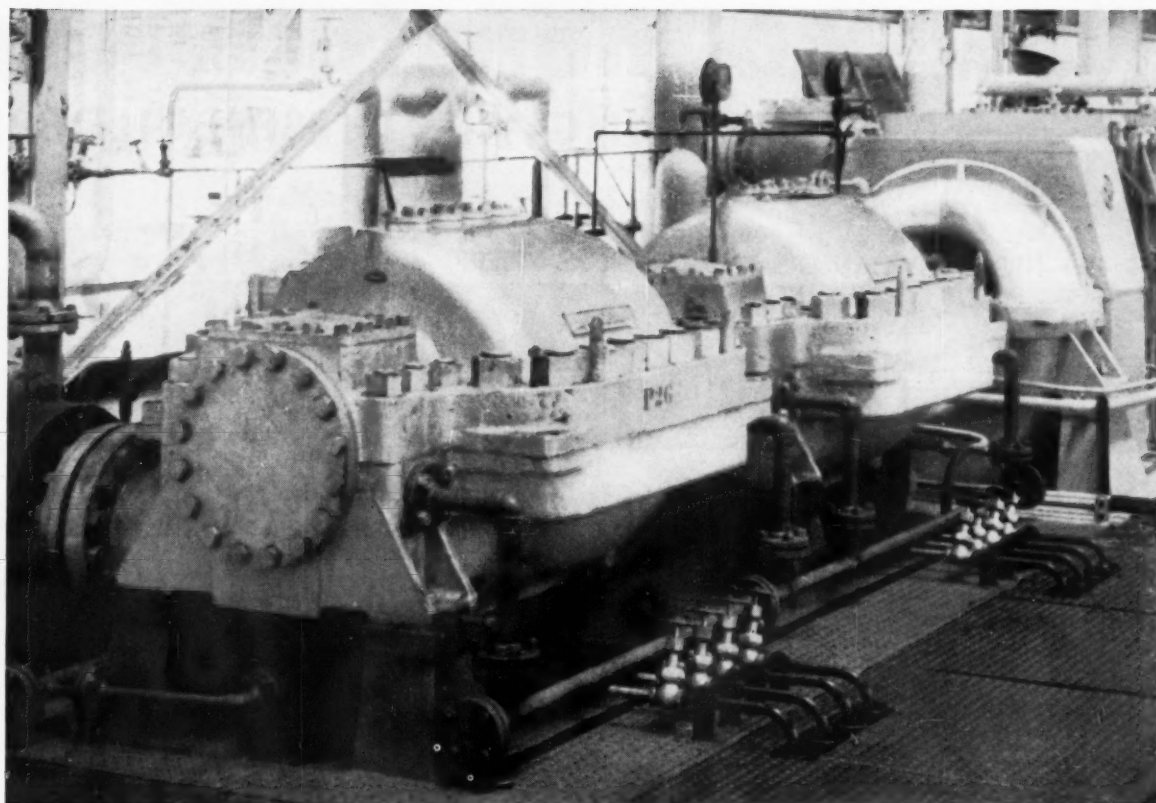
All running parts are precision-machined and need no fitting or adjusting, so the frame is sealed — dirt stays out, and the major causes of wear are eliminated!

There are many design features—including filtered force-feed lubrication and full-floating self-adjusting metallic packing—that have heretofore been found only in larger Ingersoll-Rand compressors. Let your I-R representative tell you more about these new compressors, and how they can save you money.

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**Centrifugal Compressors** (shown before lagging) for handling ethylene for cascade refrigeration in separation unit at Port Arthur, Texas, #2 Plant of Gulf

Oil. Housings are cast 3½% nickel steel that exceeds minimum 15 ft.-lb. Charpy impact test requirements at minus 150°F. Built by Ingersoll-Rand, New York, N. Y.

*In Ingersoll-Rand's ethylene refrigeration compressors...*

## **3½% nickel steel casings meet toughness requirements at minus 150°F**

A 3½% nickel steel is vital to these Ingersoll-Rand cascaded compressors used for refrigerating ethylene at Gulf Oil's Port Arthur, Texas, #2 Plant.

The compressors are built to deliver liquefied ethylene after condensation at 270 psi absolute.

In this service, the 3½% nickel steel meets ASTM A 352-52T requirements. It resists em-

brittlement and retains good impact strength right on down to minus 150°F.

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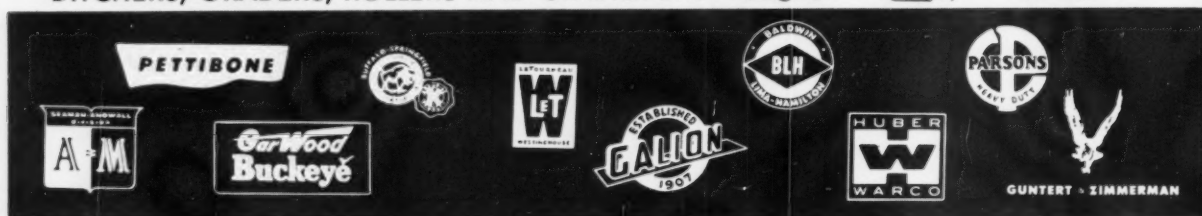
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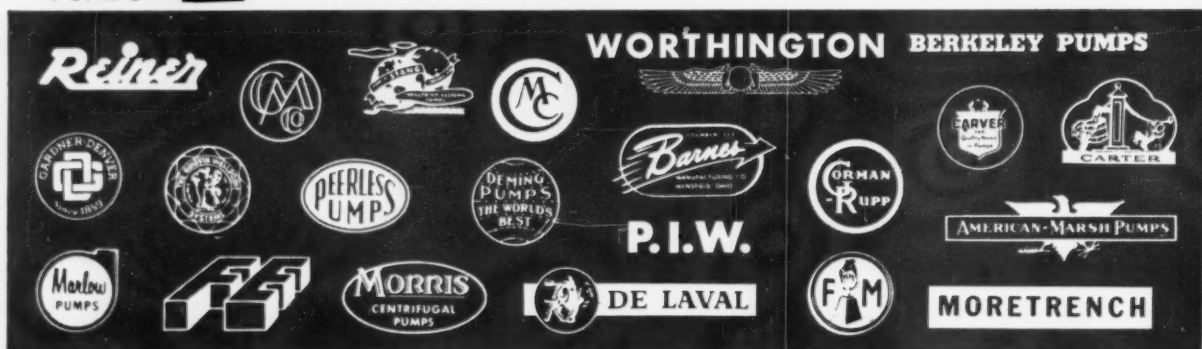
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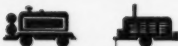


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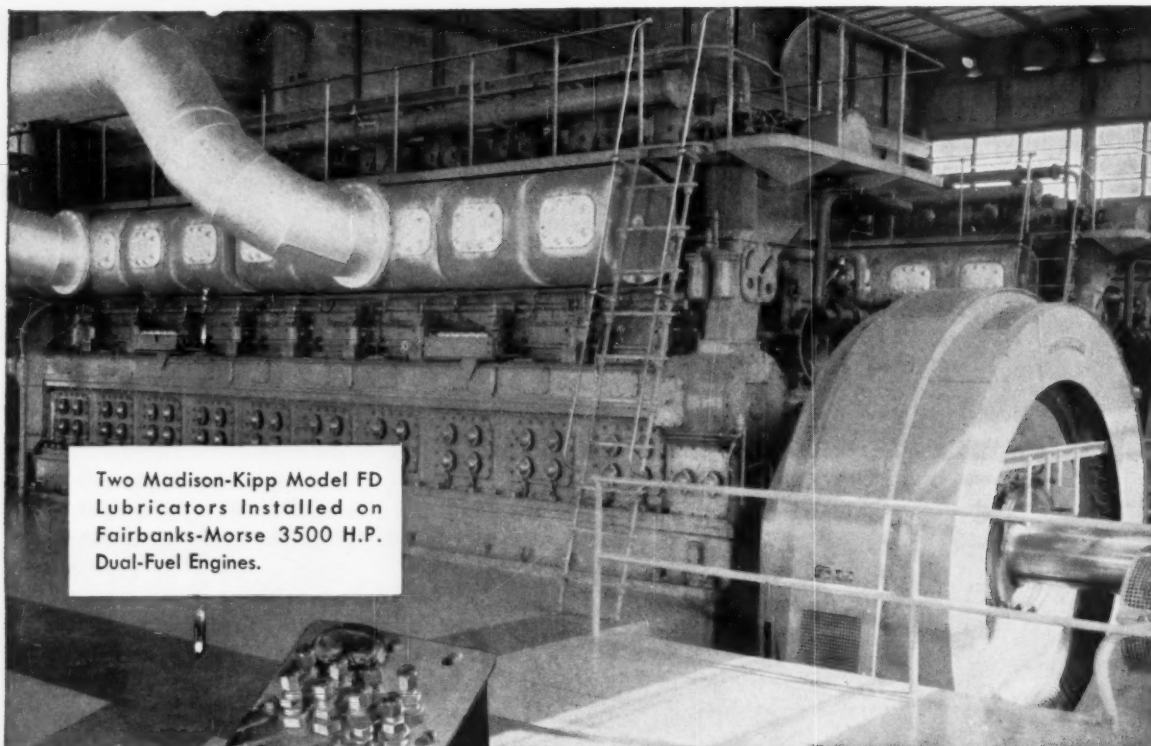
that GM Diesel covers the range from 30 to 893 H.P. with only 3 cylinder sizes results in highest parts interchangeability, lowest maintenance cost. Write for booklet, "STANDARDIZE YOUR POWER"—and learn the reasons why.

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In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

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## why you should specify



## MOTORS and GENERATORS DEPENDABILITY

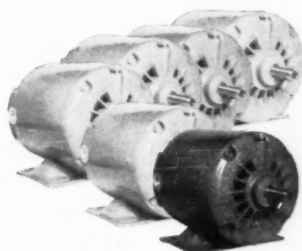
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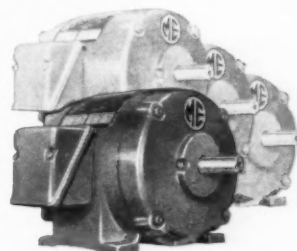
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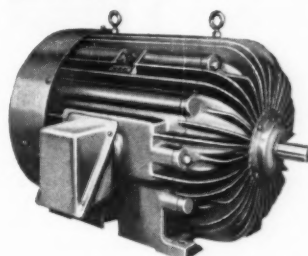
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General Purpose  
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Special Purpose:  
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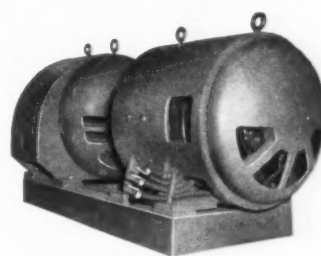
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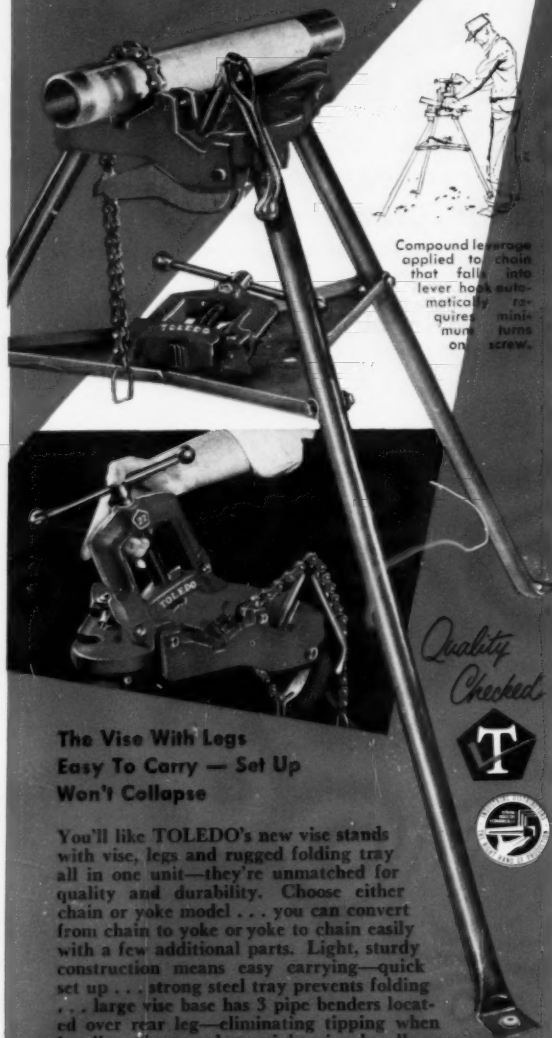
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Compound leverage applied to chain that folds into lever hook automatically requires minimum turns on screw.

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Easy To Carry — Set Up  
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Clamps of all diameters  
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without waste . . . for a few cents  
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in approximately 1 cubic foot of space.

Carry BAND-IT tool, band and buckles (all that is needed to form Band-It clamps) in this portable Clamp Warehouse, just like a tool kit. Makes 900 stainless steel clamps of all diameters—for any type clamping job, any shape of object. Especially useful for emergencies such as leaking pipe or hose. 1001 other uses.

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protect your equipment

with **DRIAIR**

A complete, self contained unit that collects and automatically ejects water and oil from air lines.

Dri Air collects dirt and rust thereby reducing wear and prolonging tool life.



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**HOW:** Using HYDRODYNE-AC, fed into air intake by drip feed lubricator.

**NOW USED:** HYDRODYNE-AC used by auto, chemical and other manufacturers, and public utilities.

**GUARANTEED:** If HYDRODYNE-AC does not perform as claimed, full refund made.

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\$9.95 per gal. in one gal. cans.

9.00 per gal. in five gal. cans.

8.00 per gal. in 55 gal. drums.

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More information available upon request.

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# GYRO-FLO *in the news*



## Truck-Mounted Drilling Rig Helps Contract Driller Meet Deadline Dates

"Take a highway truck chassis, add a 900-cfm Gyro-Flo compressor and two I-R Hydra-Boom units equipped with two D45, 4½" Bore drifter drills, and you're in business with the fastest contract-drilling unit you ever saw." So says an official of the New Jersey Drilling Co., who admits that this is a slight oversimplification. "Some planning and good design went into this rig, too. The I-R distributor and sales engineer sure did a fine job on this rig."

The truck-mounted drilling rig shown here has lived up to his every expectation—helped him finish up faster and meet the tightest deadlines with a minimum of man-hours and drilling expense.

### GYRO-FLO 900 PROVIDES AMPLE AIR POWER

A standard 900-cfm Gyro-Flo rotary portable compressor, less running gear, was mounted on a 6-wheel highway truck chassis. There was plenty of room available to mount two Hydra-Boom drills. The completely self-contained compressor provides ample air power for any job—will run both heavy-duty drills simultaneously at full pressure. The rig can move from job to job at a moment's notice and at maximum highway speeds. A frame above the compressor holds the drill towers while in transit.

### HYDRA-BOOMS CONVERT SETUP TIME TO DRILLING TIME

With two heavy-duty I-R D45 rock drills mounted on Hydra-Booms, the New Jersey Drilling Co. can set up to drill any type of hole patterns in a matter of minutes. All drill-tower motions, including power dump and swing and power cone, are controlled by the touch of a throttle. Husky hydraulic cylinders, five for each drill, have completely replaced the time-consuming muscle power formerly required to set up for each hole.

Ask your Ingersoll-Rand representative to show you how Gyro-Flo compressors and I-R rock drills can help speed your drilling work, with important savings in cost per foot of hole.



**Ingersoll-Rand**

2-835

11 Broadway, New York 4, N. Y.

AN UNBEATABLE COMBINATION . . . GYRO-FLO COMPRESSORS AND I-R ROCK DRILLS



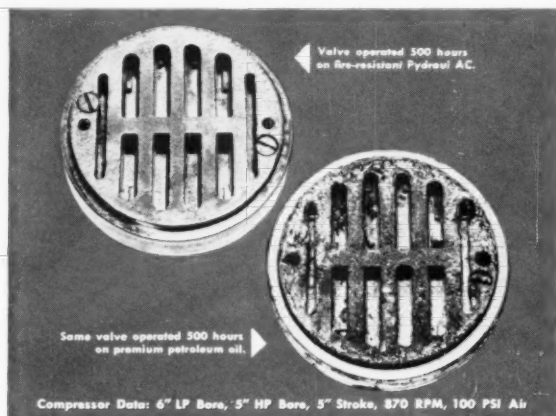
High holes, horizontal or at any angle, are no problem at all with this truck-mounted drilling rig. Operator at the control station can "spot" the drill anywhere he wants at the touch of a throttle.

Photo below shows that toe holes are "duck soup" for this Gyro-Flo 900 and Hydra-Boom combination.

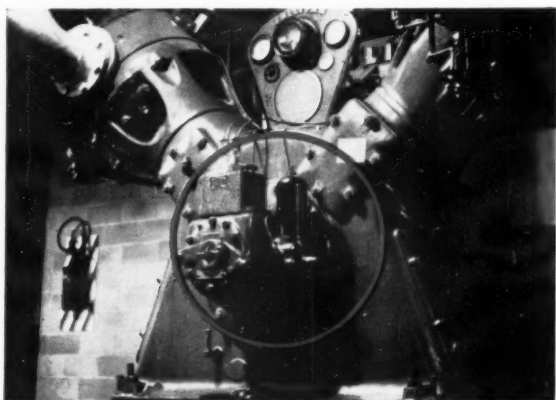


**All 3 performance benefits you want most  
from your air compressor lubricant...**

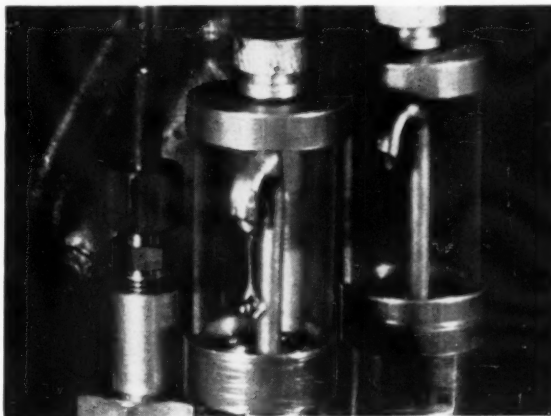
## **LOW UPKEEP • PEAK LUBRICATION • FIRESAFETY AT LOWEST COST WITH PYDRAUL AC LUBRICANT**



**Photo proof: Pydraul AC runs cleaner**—can substantially cut your air compressor upkeep costs because it reduces build-up of carbon and other deposits—extends operating time between overhauls. Side-by-side photos (above) of an exhaust valve—operated in the same industrial air compressor with only the lubricant changed—shows how Pydraul AC keeps air compressor systems freer from harmful and dangerous deposits than a premium petroleum oil. Lower maintenance costs alone usually justify your use of Pydraul AC.



**Firesafe Pydraul AC gives 2-way protection** in this danger zone. Residue from lubricants deposits inside compressor cylinders, valves and piping throughout the system—glows hot and flakes off—can unpredictably ignite flammable vapors from hot petroleum-based lubricants causing fire...explosion! Monsanto's synthetic lubricant, Pydraul AC, essentially eliminates this basic cause of most air compressor fires and explosions in 2 ways: it lessens carbon deposits and oxidation residues, and it is a *fire-resistant* lubricant.



**Pydraul AC lubricates like premium-grade oil**—good anti-wear qualities and noncorrosive features give your equipment longer life. And Pydraul AC is the one lubricant for virtually every air compressor you own—has demonstrated its excellent lubricating efficiency in hundreds of compressors of all types and sizes produced by all of the major compressor manufacturers—has operated without trouble or replacement for periods up to 5 years. Now, Pydraul AC is effectively lubricating air compressors operating at over 4500 psi. Many compressors have operated continually with exhaust air temperatures of 340° F.

**ONLY PYDRAUL AC gives you at lowest cost  
all 3 performance benefits you want most from  
your air compressor lubricant: low upkeep,  
firesafety, peak lubrica-  
tion. Write Monsanto for  
your free trial sample.**



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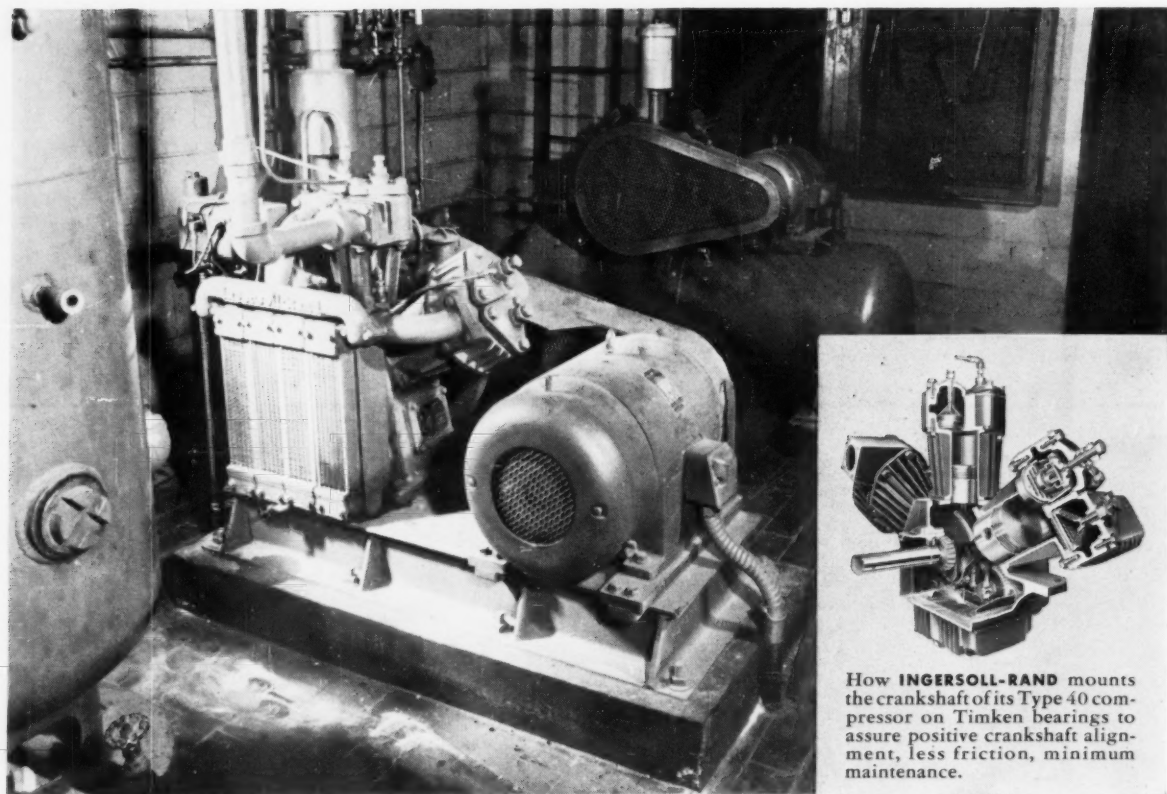
Please send me the new 16-page booklet on fire-resistant Pydraul AC lubricant for air compressors.

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Company

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City  Zone  State



How **INGERSOLL-RAND** mounts the crankshaft of its Type 40 compressor on Timken bearings to assure positive crankshaft alignment, less friction, minimum maintenance.

## House air and instrument air are always there, with compressor crankshaft on **TIMKEN®** bearings

**T**O make sure this Type 40 air-cooled compressor in a chemical company laboratory will supply dependable house and instrument air, Ingersoll-Rand mounts the crankshaft on Timken® tapered roller bearings.

Timken bearings hold the crankshaft in positive alignment. And they practically eliminate friction. Crankshaft stresses are lower because the use of Timken roller bearings shortens the distance from the center of the Timken main bearing to the center of the crankpin. Crankshaft wear is eliminated; wear on adjacent parts is minimized.

And because they hold housings

and shafts concentric, Timken bearings make closures more effective. Dirt and moisture stay out; lubricant stays in.

Timken bearings are geometrically designed and precision-made to roll true. Their taper lets them take *both* radial and thrust loads in any combination. And full-line contact between rollers and races gives Timken bearings extra load-carrying capacity.

To give you greater bearing value, we even make our own electric furnace fine alloy steel. No other American bearing maker does. For all these advantages, specify Timken bearings for the machines you buy or build. They bring

Better-ness to any machine because Better-ness rolls on Timken tapered roller bearings. Look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable: "TIMROSCO".



This symbol on a product means its bearings are the best.



# TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

*TAPERED ROLLER BEARINGS ROLL THE LOAD*